THE MOKELUMNE RIVER CHINOOK SALMON AND STEELHEAD MONITORING PROGRAM 1993-1994

Administered by:

East Bay Municipal Utility District
Watershed and Recreation Division
500 San Pablo Dam Road
Orinda, California 94563

EVALUATION OF THE DOWNSTREAM MIGRATION OF JUVENILE CHINOOK SALMON AND STEELHEAD IN THE LOWER MOKELUMNE RIVER AND THE SACRAMENTO-SAN JOAQUIN DELTA (JANUARY THROUGH JULY 1994)

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TASK OBJECTIVES

This report addresses three tasks of the 1993-94 Mokelumne River Chinook Salmon (*Oncorhynchus tshawytscha*) and Steelhead (*Oncorhynchus mykiss*) Monitoring Program:

- Monitoring of downstream-migrant salmonids within the Mokelumne River
- Evaluation of potential physical injury to downstream migrant salmonids passing over spill bays at Woodbridge Dam
- Mark-recapture experiments to determine survival of hatchery-reared chinook salmon smolts migrating through the Sacramento-San Joaquin Delta (Delta).

The purpose of these three tasks was to continue the ongoing development of information on the ecology and management of juvenile anadromous salmonids in the lower Mokelumne River (Figure 1). Task objectives and approaches of the 1993-94 investigation were modified and refined from those of previous years' to address differences in hydrological conditions, as well as investigate some specific aspects of the behavior of downstream migrant juvenile salmonids. Specific objectives of this year's program were as follows:

1) To monitor the daily abundance and downstream migratory movement of naturally produced juvenile anadromous salmonids passing Woodbridge Irrigation District's (WID) dam (Woodbridge Dam).
2) To monitor size and condition of emigrating juvenile anadromous salmonids and determine the proportions of juvenile salmon emigrating as fry and as smolt-sized salmon.
3) To evaluate juvenile anadromous salmonid emigration patterns related to environmental factors (stream flow, water temperature, lunar phase, precipitation, water turbidity, and time of day).
4) To assess the effects of juvenile chinook salmon passage over Woodbridge Dam.
5) To evaluate some aspects of specific migratory behavior, as measured by radio-telemetry and passive integrated transponder tagged fish, for monitoring juvenile salmonid responses to environmental conditions in the lower Mokelumne River.
6) To evaluate the use of a physiological indicator of salmonid smoltification, gill sodium-potassium activated adenosine triphosphatase (gill Na^+/K^+ ATPase), for monitoring juvenile salmonid responses to environmental conditions in the lower Mokelumne River.
7) To coded-wire tag naturally produced chinook salmon smolts for later assessments of survival and fishery recruitment.
8) To assess the relative survival of coded-wire tagged Mokelumne River Fish Installation (MRFI)-reared salmon smolts migrating through the Delta under two water diversion scenarios.
9) To evaluate the results of the preceding tasks as related to resource monitoring activities and management recommendations/actions for the lower Mokelumne River.

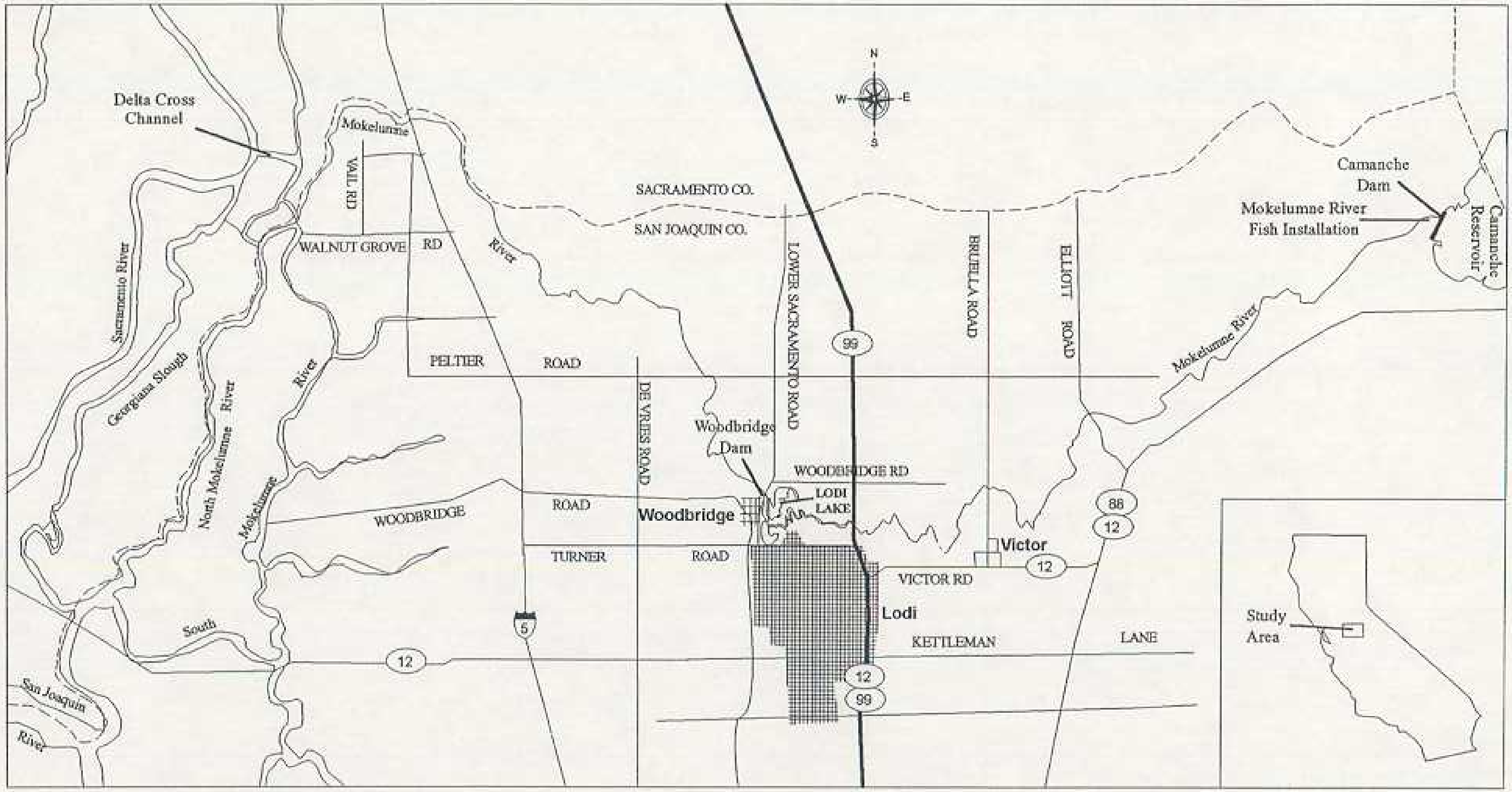

Figure 1. Map of the Mokelumne River from Camanche Dam to the confluence of the San Joaquin River.

METHODS

Downstream Migrant Trapping at Woodbridge Dam

Rotary Screw Fish Traps

Woodbridge Dam has been used as a trapping site for downstream migrant salmonids since inception of the Mokelumne River Fishery Monitoring Program in 1990. During the 1990 to 1992 study seasons, river flows were low enough that nearly the entire river flow passed through the fishways and fish bypass system at Woodbridge Dam where traps were installed to capture most downstream migrant fishes (Bianchi *et al.* 1992). During 1993, rotary screw fish traps[1] were first employed to capture downstream migrant salmonids at two locations in the lower Mokelumne River, upstream near the spawning grounds and at Woodbridge Dam. During the downstream migrant monitoring season from October 21, 1993 to June 20, 1994, two 2.4 m diameter rotary screw fish traps in tandem were fished immediately downstream from Woodbridge Dam (Figure 2). The two traps were rigidly connected side-by-side by inserting 1.2 m long pieces of 3 cm square Unistrut through the ends of the tubular fore and aft cross members of both screw traps. These Unistrut "connectors" were bolted into place with the cross members to the traps' pontoons. The trap suspension and operation system at Woodbridge Dam was similar to that described by Vogel and Marine (1994).

Fishway-Installed Downstream Migrant Traps

From June 20 through July 31, 1994, river flows past Woodbridge Dam were reduced and the majority of the flow passed the dam through the high-stage fishway and WID canal diversion fish screen bypass system. During this time period, the California Department of Fish and Game (CDFG) installed a large box trap at the outfall terminus of the fish screen bypass in the low-stage fishway pool #9a to capture 100% of the fish passing through the bypass (see Bianchi *et al.* 1992 for description of CDFG trap). East Bay Municipal Utility District (EBMUD) staff and Vogel Environmental Services (VES) biologists designed, constructed, and installed an inclined plane fish trap in the high-stage fishway pool #15 to capture 100% of the fish moving through that route of passage (Figure 3).

Fish Handling and Measurements

Rotary screw fish traps, and the Woodbridge Dam fishway-installed traps when in service, were regularly tended twice each day. This was generally done early in the morning and late in the afternoon. During periods of high riverine debris loads and/or large catches of fish, the traps were attended two to three additional times each day, near mid-day and/or mid-evening. Fishes captured were transferred from the trap live boxes with dip nets to 20-liter buckets filled with

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[1]E.G. Solutions, Inc., Corvallis, Oregon

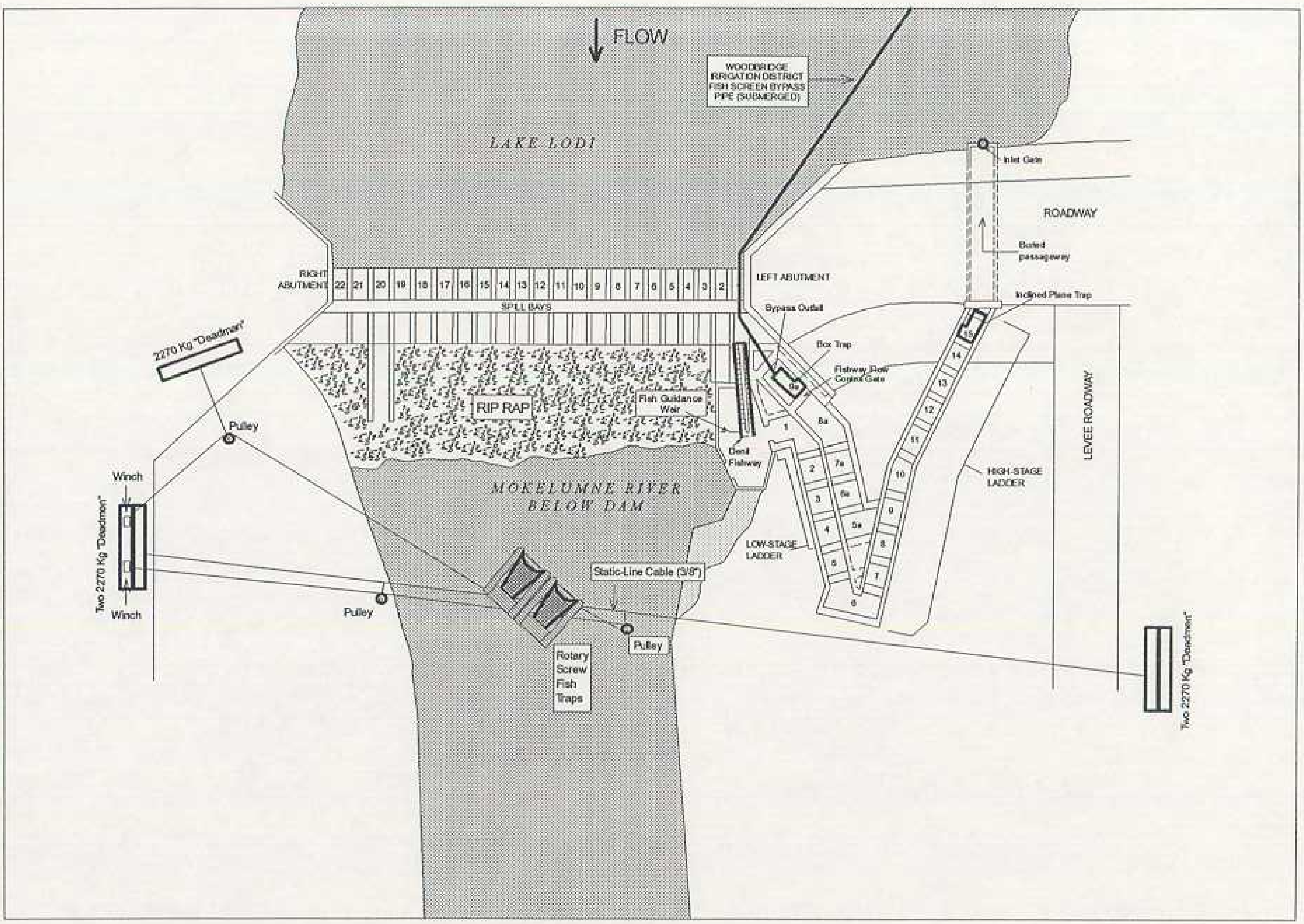
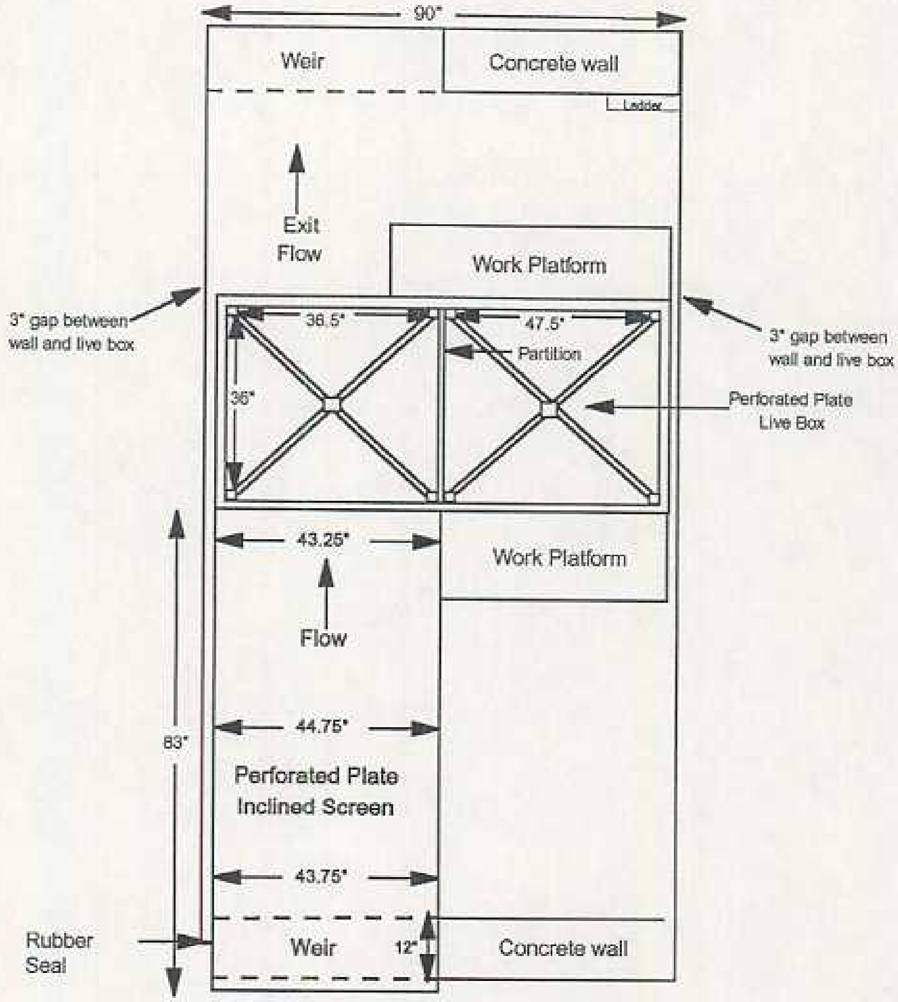


Figure 2. Plan view of Woodbridge Dam showing locations of box trap, inclined plane trap and downstream migrant rotary screw traps.

a) **PLAN VIEW**



b) **SIDE VIEW**

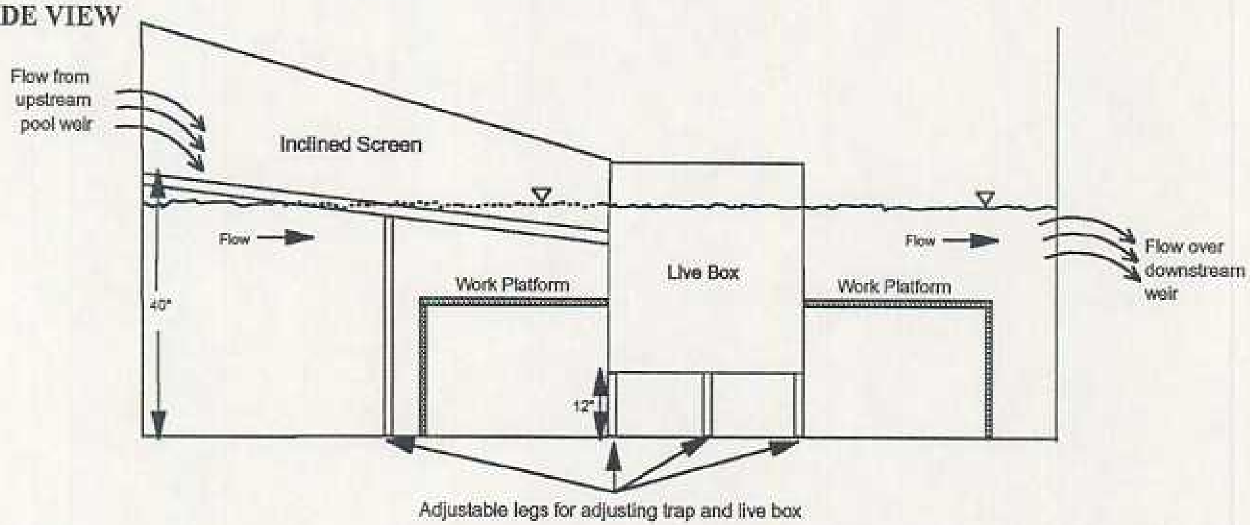


Figure 3. Schematic diagrams of the incline screen fish trap installed in pool 15 of the high-stage fishway for capturing downstream migrant juvenile salmonids at Woodbridge Dam on the Mokelumne River.

fresh river water to which tricaine methane sulfonate[2] was added at *ca.* 30-50 milligrams/liter for rapid and short-term induction of moderate sedation for most of the species captured (Summerfelt and Smith 1990). All fishes were identified in the field to species (when possible) and enumerated.

Up to 30 of each salmonid species captured in each trap during each trapping period were randomly sampled for measurements of total length (TL) and fork length (FL) (in mm) and weighed (in grams) on an Ohaus CT1200 portable balance. Weighing was done in tared beakers of fresh water set on the balance pan. Individual sedated fish netted in a small dip net were gently blotted on a moist sponge to remove excess water prior to weighing to ensure measurement of true wet weight. These measurements were recorded along with observations of disease and injury. All adipose fin-clipped salmon (indicating coded-wire tag implants) and salmon otherwise marked that were observed among the fish counted or measured were recorded. Upon completion of counting and measuring fish, fish were gently placed in another 20-liter bucket of fresh river water to recover from sedation prior to being released downstream from the traps (except during June 20 to July 31, 1994 when all fish were transported to Rio Vista, California and released in the Sacramento River). Total processing time for individual fish from sedation and measurement to recovery and release was generally 5 to 15 minutes. Fish were distributed among several buckets to avoid overcrowding and depletion of dissolved oxygen during the processing procedures. To insure dissolved oxygen remained at sufficient levels, water was exchanged in the holding buckets at regular intervals when necessary (about every 5-10 minutes).

Surface water temperature was measured with a mercury-filled thermometer and water clarity was measured with a secchi disk at the trapping site or in Lake Lodi immediately upstream from spill bay #1 each time the traps were attended. Any other relevant biological or environmental conditions potentially affecting trap performance or fish behavior (*e.g.*, incidence of predators, incidence of poaching, debris loads in traps, changes in river flow or spill configurations at Woodbridge Dam) were recorded when observed.

Trap Maintenance and Debris Management

Riverine and urban-generated debris was periodically problematic in the operation of the rotary screw traps downstream from Woodbridge Dam. Of particular importance were large tree limbs and floating lumber. Tree limbs and floating lumber larger than about 40 cm long and 10 cm in diameter entrained into a screw trap usually lodged to stop the rotation of the trap. These occurrences required increased trap inspection frequencies and were most common during the stormy winter season and during increases in discharges from Camanche Dam. Discarded and tangled monofilament fishing line was also a periodic problem especially during episodes of illegal fishing in the vicinity of the dam and traps during the spring and summer months.

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[2] "Finquel" formulation, sold by Argent Chemical Laboratories, Redmond, WA.

Fishing line wrapped around the main shaft of the rotating cone and the central axle of the livebox drum screen resulted in wear and tear on moving parts and nylon bushing components.

Algal growth on the perforated rotating cone of the traps was removed by brushing all surfaces when growth occurred, which could be as often as twice daily. This algal growth occurred predominately during the late spring and summer months.

Trap Calibrations for Abundance Estimates

Fish capture efficiency of the rotary screw trap system was measured at nine intervals during the monitoring season. All juvenile salmon used for these mark-recapture tests were obtained from MRFI and were of Mokelumne River or American River origin. Fish were anesthetized (*ca.* 70 to 100 milligrams/liter tricaine methane sulfonate solution) and marked by excision of either the right or left pelvic fin or by excision of a small, but distinct, portion of the upper or lower lobe of the caudal fin. These fish were allowed to recover in cylindrical 25-liter PVC live cars (30 cm diameter, 40 cm long with soft nylon 2 mm Delta mesh covered ends) placed in a protected refuge in the low-stage fishway for 8 to 24 hours prior to their release for the tests. A sample of fifty fish from each release group was measured for FL and examined for mark quality prior to release.

Paired test releases, one during daylight and one during night time, were made on each test date. Fish releases were made approximately 20 m to 30 m upstream from the traps where most of the dam discharges confluenced, which primarily consisted of spill from spill bays #2-#5 and the fishway discharge. The release groups were divided into two or three groups of approximately equal sublots and released across the width of the dam's discharge. Fish were released from 20-liter buckets by gently dipping the lip of the bucket underwater and lifting the bottom in one motion. We assumed that the release distance from the trap and the flow configuration of the dam's discharge issuing toward the traps allowed fish to seek a preferred portion, or natural migration route, in the discharge flow or to mix to a homogeneous distribution within the discharge flow prior to encountering the traps.

Live box retention efficiency of the traps, primarily for larger sized smolts, was measured several times during the monitoring period from May 21 to June 4, 1994. Fish marked by excising a pelvic fin or fish that were coded-wire tagged (CWT) and received an adipose fin clip were used for these evaluations. Numbers of marked fish used for these evaluations ranged from 20 to 122. Use of the combinations of fin-clip marks was coordinated with all other mark-recapture experiments (*e.g.*, trap efficiency releases) to avoid conflicting purposes between tests. Fish were placed in the live boxes of the traps after 2 to 24 hours recovery from the fin removal procedure. Fish were left in the live box until the following trap check (a range of about 6-16 hours) when they were counted, measured for FL and TL, and released downstream from the trap.

Live box fish retention was examined after the unusually low recoveries of test release fish on

May 18-19 test. On two successive nights, May 21 and May 22, retention of marked fish placed in the live boxes were 51 of 107 and 65 of 88, respectively. One day test resulted in 122 of 123 fish retained in live box over a six-hour period. Several potential escape routes were eliminated between rear drum screen and seals; however, subsequent retention tests revealed that fish were still escaping in small numbers from the live box both during day and night. The only possible escape route was for fish to swim back upstream through the rotating auger cone of the screw traps. Rotation of the traps was generally between 2 and 3.5 revolutions per minute during the period of concern. This was apparently not sufficient to prevent larger, strong-swimming smolts from swimming against the current back out of the live boxes, through the auger cone, and away from the trap. We believe this behavior occurred for both wild trapped fish as well as for marked fish used in trap calibration tests during the period from about May 15 through June 20, 1994. So, trap calibration results should still be representative of overall trap and live box retention efficiencies during this period. However, to ensure sufficient recoveries for improved abundance estimation and sampling for size distributions, we recommend that the trap be located and operated where at least 4 rpm may be maintained.

Abundance and Timing of Emigration

The numbers of each species and each age class of salmonids captured were compiled on a daily basis. The age 1+ size criteria for chinook salmon were based on previous years' juvenile salmonid monitoring results and substantiated by the sizes of adipose-fin-clipped salmon released at age 1+ during the fall of 1993 and captured during each of the following time periods:

Time Period	Age 1+ Size Criterion
January 1 through February 28, 1994	> 75 mm TL
March 1 through May 31, 1994	>125 mm TL
June 1 through July 31, 1994	>150 mm TL

Morning and afternoon trap capture numbers were combined to provide daily totals for each trap site. Daily counts were compiled into weekly totals for several analyses.

Outmigrant abundance estimates were generated from trapping efficiency results. Trap efficiency recovery rates for each test date were computed for the day and night releases (Table 1). Based on chi-square analyses, distinctly different results were obtained for the day and night releases, except for the May 18-19 test. And, except for two periods represented by tests conducted on March 10 and March 16, night-time release recoveries were significantly higher than those conducted during daylight.

The average trapping efficiency for each test date was applied to each respective period for which it was representative in terms of river flow, fish size, numbers of traps in service, and observed incidence of predators as follows:

Table 1. Trap Efficiency Test Results for Tandem Rotary Screw Fish Trap System at Woodbridge Dam During January through June 1994.

	RELEASE GROUP INFO.			RECAPTURE GROUP INFO.							WID	# OF ROTARY
DATE	TIME	M	AVG FL (mm)	R(24h)	AVG FL (mm)	R(24h)/M	Chi-Sq.(day-night)	SECCHI (cm)	WATER TEMP (F)	RIVER Q (cfs)	ANAL Q (cfs)	TRAPS FISHING
02/23/94	935	363	50 (s=8)	65	54	0.179	28.9**	83	55.0	150	0	2
02/23/94	**1925**	**389**	**50 (s=8)**	**108**	**53**	**0.278**		95	55.0	146	0	2
03/10/94	920	398	43 (s=3)	56	42	0.141	25.1**	75	58.6	112	0	1
03/10/94	**1920**	**347**	**43 (s=3)**	**15**	**48**	**0.043**		93	58.6	106	0	1
03/16/94	910	251	47 (s=3)	22	47	0.088	13.3*	195	58.5	99	0	1
03/16/94	**1934**	**300**	**47 (s=3)**	**8**	**46**	**0.027**		160	60.4	99	0	1
03/25/94	850	350	44 (s=4)	57	46	0.163	39.2**	138	64.0	114	0	1
03/25/94	**2025**	**366**	**44 (s=4)**	**108**	**48**	**0.295**		178	63.5	115	30	1
04/01/94	855	347	50 (s=7)	22	49	0.063	158.8***	140	63.6	95	42	1
04/01/94	**2010**	**335**	**50 (s=7)**	**79**	**51**	**0.236**		143	64.0	102	52	1
04/20/94	941	396	82 (s=7)	25	80	0.063	245.7***	118	62.9	162	88	1
04/20/94	**2040**	**358**	**82 (s=7)**	**97**	**83**	**0.271**		135	63.3	160	90	1
05/04/94	925	252	95 (s=6)	18	89	0.071	99.2***	148	64.8	154	106	1
05/04/94	**2200**	**239**	**95 (s=6)**	**56**	**93**	**0.234**		150	62.2	153	115	1
05/19/94	915	273	75 (s=8)	1	62	0.004	2.92 (NS)	148	59.9	162	86	1
05/18/94	**2130**	**290**	**75 (s=8)**	**3**	**79**	**0.010**		148	59.9	162	94	1
05/29/94	940	255	81 (s=6)	6	80	0.024	391.3***	150	66.9	121	106	1
05/29/94	**2200**	**230**	**81 (s=6)**	**52**	**79**	**0.226**		150	66.9	126	106	1

Notes: *The mark-recapture notation of Ricker (1958) is used with R = #'s of marked fish recaptured and M = #'s of marked fish released.*
R(24h) denotes the recapture of marked fish during two trapping periods following their release.
Average secchi depths, water temperatures, and stream flows at Woodbridge Dam are for the 24 hour period immediately following marked fish release.
Day time recapture-release data in normal font - - ***night time recapture-release data in bold font.***
*Chi-square analysis results levels of significance are indicated by *(P<0.05), **(P<0.01), ***(P<0.001), NS(not significant).*

Applicable Period	Test Date Applied	River Flow (cfs)	Trap Type (#)
1/15/94 - 3/08/94	2/23/94	114-174	Rotary Screw (2)
3/09/94 - 3/13/94	3/10/94	106-112	Rotary Screw (1)
3/14/94 - 3/23/94	3/16/94	91-108	Rotary Screw (1)
3/24/94 - 3/30/94	3/25/94	103-116	Rotary Screw (1)
3/31/94 - 4/18/94	4/01/94	95-129	Rotary Screw (1)
4/19/94 - 4/27/94	4/20/94	155-202	Rotary Screw (1)
4/28/94 - 5/16/94	5/04/94	146-180	Rotary Screw (1)
5/17/94 - 5/25/94	5/19/94	134-177	Rotary Screw (1)
5/26/94 - 6/20/94	5/29/94	71-155	Rotary Screw (1)
6/21/94 - 7/31/94	100% of downstream migrants recovered in fishway traps.		

Daily diurnal and nocturnal trap capture numbers were divided by the appropriate day or night trap efficiency rate applicable to the period in which it occurred to calculate an estimated abundance index. Diurnal and nocturnal abundance estimates for individual days were summed to produce daily abundance estimates. The individual daily abundance estimates were summed to produce abundance estimates for various time periods. The estimates of abundance based on these trap efficiency results should be considered as an index of relative temporal abundance at the release location for trap calibration fish (versus recapture location) and not as a population estimate. It is important to recognize that these estimates do not quantify potential fish losses between the release and recapture locations. For example, if there were no fish loss (as compared to some unquantified loss) between the release and recapture locations, the abundance indices would be the same in either case because the indices are reflective of the release location, not the recapture location. Actual fish losses between the release and recapture locations (e.g., attributable to predation) are unknown and cannot be quantified with these indices.

Fish Size and Condition

The size parameters of FL, TL, and weight measured on subsamples of young-of-year (Y-O-Y) and yearling salmon catches for samples of up to 60 fish per trap each day were compiled on a daily basis. Fulton's Condition Factor, given as (100 x weight/TL^3) by Bagenal and Tesch (1978), where weight is in grams and TL is in mm, were computed for each fish for which TL and weight measurements were obtained. Daily and weekly averages for FL, TL, weight, and condition factor of Y-O-Y and yearling salmon were computed and compiled for analysis.

Observations of injuries on trapped fish were described, recorded, and compiled on a daily basis, as well as the numbers of dead fish found in the traps during each day. These incidents of injury and mortality were examined with regard to effects of predators, debris fouling of the traps, and other conditions which may have contributed to their occurrence.

Physical Environmental Data

Daily environmental data for January - July 1994 were obtained from the following sources:

- River Flow passing Woodbridge Dam: U.S. Geological Survey (USGS) gauging station (#11325500) located on the Mokelumne River downstream of Woodbridge Dam near River Mile 37.

- WID's Canal Diversions: USGS gauging station (#11325000) located in the canal near the point of diversion at Woodbridge, California.

- Local Watershed Precipitation: National Weather Service field data collection station at Camanche Dam, San Joaquin County, California.

- River Temperature at Woodbridge Dam: Ryan Model RTM 2000 thermograph[3] installed in pool #6a (and pool #5a after June 20, 1994) of the low-stage fishway and surface temperatures generally measured twice daily during morning and afternoon with a mercury-filled thermometer.

- Water Turbidity Index (Secchi Depth): Generally measured twice daily in the river channel off downstream end of screw traps, or in Lake Lodi immediately upstream from spill bay #1 at Woodbridge Dam.

- Lunar Age and Regional Sunrise/Sunset Timing: *1994 Old Farmer's Almanac*, Yankee Publishing Inc., Dublin, New Hampshire.

- Sacramento-San Joaquin Delta Water Conditions: U.S. Bureau of Reclamation, Central Valley Operations Coordinating Office, Sacramento, California and California Department of Water Resources, Sacramento, California.

Diel Migration Pattern Surveys

Diel patterns of the migration behavior of chinook salmon smolts were assessed on two dates during the height of the emigration period. These diel surveys were conducted at the Woodbridge Dam trap site on May 11-12 and May 24-25, 1994. On these dates, traps were tended hourly for a full 24-hour cycle using the same previously described fish handling and trap tending protocols, except that the trap was tended by boating over to its fishing position in the channel rather than pulling it to shore. This trap tending procedure allowed the trap to operate continuously during the entire diel survey period. Numbers of juvenile salmon captured during each of the three diel surveys were compiled on an hourly basis over the course of the 24 hours of survey for each date. Trap efficiencies for applicable diurnal and nocturnal time periods were applied to hourly trap captures to compute and compare hourly estimated abundance of downstream migrant fall chinook salmon smolts during these two survey periods.

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[3]Ryan Instruments Inc., Redmond, Washington

Physical Injury Tests at Woodbridge Dam

Tests were conducted at Woodbridge Dam to assess the potential for fish mortality attributable to young chinook salmon passing over the top of Woodbridge Dam and into the dam spill bays. Experimental groups of approximately 500 juvenile chinook salmon (obtained from MRFI) were released directly into spill bays on top of Woodbridge Dam. Immediately prior to release, these fish were transferred from an oxygenated holding tank positioned adjacent to the left abutment of the dam into five 5-gallon buckets for each release group, hand carried to the release location, then poured into a 12-inch diameter PVC pipe (7 feet long) with its end positioned directly over the lip of the spill passing over the Woodbridge Dam flashboards. Positioning of the end of the PVC pipe was critical to ensure released fish did not escape upstream into Lake Lodi but instead passed over the spill on the dam and into the spill bays.

Experimental fish were recaptured downstream of the dam by positioning the rotary fish trap (previously described) into the flow emanated from spill bays where experimental fish were released. After approximately 15 minutes following the experimental fish release, all salmon captured within the rotary trap were removed. It was assumed that the capture of any wild fish during the 15-minute sampling period was minimal and would not significantly influence study results. Recaptured experimental fish were transferred to shore in a live car (12-inch diameter, 16-inch long PVC pipe with both ends covered with 1/8-inch knotless, nylon Delta mesh). All fish remained in water continuously following removal from the rotary trap. Each live car was placed in a protected area of the fishway (pool #5a) where fish were monitored daily for mortalities over a seven-day period.

For each experimental group of fish released into a spill bay, a control group of approximately 60 or 100 fish was released into the rotary trap for comparative purposes. After each experimental group of fish was released, recaptured, and placed into the fishway, a control group of fish was removed from the oxygenated holding tank positioned adjacent to the left abutment of the dam and placed into a 5-gallon bucket. These fish were then transferred out to the rotary trap where they were released directly into the rotary trap entrance. The estimated time the fish remained in the transfer bucket was approximately the same as for the comparable experimental fish group. The control group of fish remained in the rotary trap for approximately 15 minutes and were removed and transferred in a live car to the fishway as previously described for experimental groups of fish.

All attempts were made to treat experimental and control groups of fish the same, except for the experimental fish group's passage over the spill bays prior to recapture in the rotary trap. The numbers of fish within each group were purposefully not individually enumerated prior to release to minimize handling stress and potential physical injury attributable to handling. The numbers within each group were estimated by weighing in buckets of water to attempt relative similarities in fish densities between experimental and control groups after recapture. The intent was to minimize any differences in mortality that could be attributed to differences in densities of fish held in the same sized live cars during subsequent monitoring after recapture. Fish were not fed during the seven-day monitoring period, but they had some limited ability to feed on water-borne natural feed because riverine water could freely pass through their live car. Any observed differential mortality between the experimental and control groups over the seven-day monitoring period was assumed to be primarily attributable to factors affecting fish after release into the dam spill and recapture in the rotary trap.

Coded-Wire Tagging of Wild Smolts at Woodbridge Dam Trap Site

Tagging of naturally produced juvenile salmon with coded-wire tags was initiated upon a dramatic increase in the number and size of juvenile salmon (≥75 mm TL) being captured at the Woodbridge Dam traps. Beginning on April 8, 1994 and continuing through the monitoring season until July 31, 1994, all juvenile chinook salmon captured at the Woodbridge Dam site were tagged by injecting 0.5 mm binary coded-wire tags into their head cartilage using a NMT[4] Mark IV tagging machine and marked by excision of the adipose fin with Mitex fine surgical scissors. Fish were handled as previously described for fish handling and measurement with the additional procedures of injecting tag wire, passing fish through a quality control device (QCD) to insure tag implantation, and excising adipose fins prior to their placement into a recovery tank of fresh flowing river water. A single tagging machine with QCD provided by EBMUD was set up daily on the grate covering pool #15 of the high-stage fishway. Water was pumped from the fishway to operate the hydraulic controls of the QCD and to provide cool flowing water to a 120-liter plastic tank used as a recovery bath for the fish. A shade fabric (approximately 60% light reduction) was installed over the entire work area to control sun heating of equipment and fish. Upon recovery, fish were placed in 20-liter buckets at densities of no more than about 60 fish per bucket and hauled approximately 100 m downstream from the trap where they were released. Total time in transit was one to three minutes. Alternatively, during June 20 to July 31, 1994, all tagged fish were placed in live cars (previously described) after recovery and held for 1 - 2 days before being transported to the Sacramento River at Rio Vista for release.

Two tag codes assigned to EBMUD were used for tagging naturally produced chinook salmon smolts captured at Woodbridge Dam during 1994:

Tag Code	Time Period	Release Location
6-1-13-1-4	April 8 - June 20, 1994	Mokelumne R. at Woodbridge Dam
6-1-13-1-5	June 21 - July 30, 1994	Sacramento R. at Rio Vista, CA.

The use of two codes allocated to these two periods will allow some inferences to be made regarding the survival and fishery contributions of early and late emigrating naturally produced smolts when analyzing later tag returns. These two time periods also correspond to fish

[4]Northwest Marine Technologies, Shaw Island, Washington.

captured, tagged, and released at Woodbridge Dam (early period) and to fish captured, tagged, transported, and released in the Sacramento River at Rio Vista, California (later period).

The quality of tagging and latent mortality associated with handling during tagging were assessed at two different times for the early period tag code. Samples of 37 and 49 tagged fish were placed in 25-liter PVC live cars (previously described) at densities of about 15 fish per live car and held in a protected area of low-stage fishway (pool #5a) for 5 to 7 days[5]. The live cars were checked daily for mortalities. At the end of the holding period, all fish were mildly sedated with tricaine methane sulfonate (*ca.* 30 to 50 milligrams per liter), examined for quality of the adipose fin clip, and passed through the QCD to detect tag retention. After this procedure, all fish were released as previously described. During the later tagging period, due to adverse fish holding conditions because of high water temperatures, no tag retention assessments could be performed for the second tag code applied.

During the period of June 21 to July 31, 1994, when water temperatures were elevated in the reach of the Mokelumne River downstream from Woodbridge Dam, all fish captured and coded-wire tagged at Woodbridge Dam were transported and released in the Sacramento River at Rio Vista, California (municipal boat launch). Fish were allowed to recover for 24 to 48 hours in live cars placed in a protected area of the low-stage fishway (pool #5a) prior to transport. A pick-up truck-mounted 500-liter, insulated, fiberglass fish hauling tank with bottled oxygen aeration (1.5-3.0 liters/minute) was used to transport fish. River water with approximately 0.7-0.9% salt (NaCl added) was used as the transportation medium to minimize osmotic stress during handling and transport (Carmichael and Tomasso 1988, Long *et al.* 1977, Wedemeyer 1992). Water temperature was carefully monitored and recorded when loading fish, occasionally during transport, and upon arrival at the release site. Transport time was generally about 1 hour and water temperature generally did not change by more than 1°F during transport. Temperature of the receiving water was measured and recorded prior to release of the fish. If water temperatures between the haul tank and river differed by more than 4°F then tempering of the hauling water was performed prior to release. Tempering consisted of exchanging water in the haul tank with receiving water to gradually acclimatize the fish to the receiving water temperature at a rate of about 2°F per 15 minutes. Fish mortality and any other biologically relevant observations at release were noted and recorded.

Coded-Wire Tagging of Hatchery Smolts and Delta Survival Experiments

As in 1993, CDFG provided a trailer outfitted with coded-wire tagging equipment for our use in tagging chinook salmon smolts reared at the MRFI for mark and recapture experiments of smolt survival in the Sacramento-San Joaquin Delta. The trailer was equipped with six marking stations each with a NMT Mark IV tagging machine, a QCD, and a stainless steel anesthetic bath

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[5]Note: CDFG holds tagged hatchery fish for a minimum of 21 days for quality control assessment; however, this was not practicable under field conditions at the Woodbridge Dam site.

pan. A stainless steel trough running along the length of an interior wall of the trailer was supplied with continuously flowing water pumped from a hatchery water supply for loading and holding fish in the trailer prior to being tagged. A PVC return pipe manifold system that ran the length of the trailer's floor passing beneath each station served to collect and carry tagged fish back outside to a receiving raceway. Each station was plumbed to receive water pumped from the hatchery water supply. This plumbing system provided water to operate the QCD's hydraulic sorting switches, which separated correctly tagged from untagged fish, and to carry tagged fish through the return pipe system. The trailer was also equipped with a recirculating anesthetic system consisting of a 120-liter plastic barrel head tank, copper chilling coil, aerator, and submersible pump for pumping anesthetic solution through a PVC distribution manifold to each station. Anesthetic solution returned to the head tank by gravity through a return manifold pipe for reconditioning.

The tagging procedure was as follows. Fish were loaded directly from the hatchery raceway into the trailer's holding trough from which fish tagging technicians netted groups of fish to be tagged. In netted groups of about 50 to 60, the fish were mildly anesthetized in aerated, salted (0.7-0.9%), buffered tricaine methane sulfonate solutions (*ca.* 70 to 90 milligrams per liter, with 1:1 sodium bicarbonate as buffer). The temperature of the anesthetic solution at each station was monitored regularly by each worker or a supervisor. The anesthetic solution was changed regularly at 2 to 3 hour intervals or more frequently if the time for induction of anesthesia increased to more than about 1.5 to 2 minutes. Once the fish were anesthetized, a 1 mm binary coded-wire tag was injected into the head cartilage of each fish using the tagging machine, the adipose fin was excised with a pair of fine-pointed surgical scissors, and the fish was passed through the QCD. Those fish which the QCD detected as untagged were automatically directed to a recovery bucket and the QCD issued a warning tone to the operator. These fish were passed back through the QCD to double check the rejection and re-tagged if necessary. The efficiency of tagging, proper operation of QCD's, and tag placement for each operator and tagging machine was checked two to three times daily during tagging operations. Samples of 25 to 100 fish were collected from each station's QCD outflow and passed back through another QCD for confirmation of tagging efficiency and QCD operation. A subsample of 3 to 10 of these fish were dissected to confirm proper placement of the tags and the tagging machines were adjusted if necessary. Machine cleaning and major repair or adjustments were conducted at the end of each tagging day.

A total of approximately 207,000 smolts at a size of 90 fish per pound were tagged for the 1994 Delta survival study. These fish were of Mokelumne River origin incubated, hatched, and reared at MRFI. Four tag codes assigned to EBMUD were used during April 11 to April 25, 1994 to tag these fish. The tag codes were allocated to four groups of about 52,000 fish each. The initial experimental design was a fully duplicated release design with two groups paired as replicates in each of two experimental releases. The two replicated experimental releases were scheduled to occur during different Delta water export conditions, one in early May 1994 and one in late May 1994. Because of space and manpower constraints, CDFG was unable to release the fish as planned; each of the paired replicate coded-wire tag groups were loaded and transported together to the release site by CDFG. This violated the original experimental design requirement for independent replication groups and resulted in a pseudo-replicated release consisting of two sublots for each experimental release (see Hurlbert 1984 for a discussion of pseudo-replication). The resulting coded-wire tagged release groups were as follows:

Experimental Group	Tag Codes
Early Season Release	6-48-03 & 6-48-04 mixed
Late Season Release	6-48-01 & 6-48-02 mixed

The main impact to the original experimental design of the mixed sublot release was the limitation of the resulting release design's capability to generate a statistical estimate of sampling variance for refined survival estimates.

During the pre-release holding period, CDFG maintained records of all mortalities in each of the tag code groups. Each of the tag groups were checked for tag retention 18 to 31 days after being tagged. Samples of about 300 to 500 fish for each of the tag groups were mildly sedated in a 50 milligrams per liter solution of tricaine methane sulfonate and singly passed through a QCD set up alongside the raceway. Then following the procedure outlined by CDFG, the proportion of fish detected without tags for each sample was used to adjust for total numbers of fish retaining tags after subtracting mortalities from the number originally tagged (F. Fisher, CDFG, Red Bluff, CA, personal communication). Two days prior to release of each of the composite groups, a sample of 40 to 80 fish were measured for FL and TL and weighed and their condition factors were calculated.

CDFG transported and released each of the composite tagged groups of fish, 6-48-03/04 on May 10, 1994 and 6-48-01/02 on May 23, 1994. Fish were released at New Hope Landing at the confluence of the Mokelumne River and the central Delta. A sample of 70 to 90 tagged fish were netted from the transport tank after transport to the release site, placed in a 25 liter live car, and subsequently held at the release site for 24 hours to assess post-transport stocking mortality. Live cars were attached to a boat dock adjacent to the release site at a depth of about 0.75 m to 1 m of water. Fish mortalities among those held were recorded after 24 hours and the surviving fish were then released. Subsequent recapture of the marked experimental release groups was conducted through June 1994 by the U.S. Fish and Wildlife Service's (USFWS) Sacramento-San Joaquin Estuary Fishery Resource Office using a standardized, routine trawl sampling program at the western outflow of the Delta near Chipps Island (P.L. Brandes, USFWS, Stockton, CA, pers. comm.). USFWS processed recaptured fish and identified coded-wire tag samples.

Coded-Wire Tag Summaries and Assessment

Coded-wire tagging data for both wild and hatchery reared groups were compiled to indicate initial numbers of fish tagged, tag retention, post-tagging mortality, size of fish at time of release, and dates of release and release objectives. These data were previously submitted to CDFG in their reporting format during July and August 1994. Tagging data for both wild and hatchery release groups are also presented in this report. Tag recovery data for the Delta survival experimental releases were compiled by USFWS. USFWS provided preliminary computed survival indices (S_T) for each of the tag codes recovered during their surveys.

Passive Integrated Transponder (PIT) Tags: Assessment of Individual Fish Migration

Implantation of PIT tags in juvenile salmon for investigations of individual fish migration behavior was conducted at a marking station at the hatchery. Because of the surgical nature of this procedure, fish were tagged at the hatchery where water temperature was cooler than at Woodbridge Dam and transport stresses could be avoided prior to tagging. The procedure of Prentice *et al.* (1990) was followed for PIT tag implantation. A spring-loaded injector with a 12-gauge veterinary vaccinating needle loaded with a PIT tag, both disinfected with a 0.5% povidone-iodine solution (Veterinary grade Betadine solution) for at least 3 minutes and rinsed with sterile physiological saline (0.9% NaCl), was used to implant the tag in the peritoneal cavity of the fish. Fish were anesthetized before PIT implantation in groups of 25 to 30 in aerated solutions containing 100 mg/liter 2,2,2 tricaine methanesulfonate buffered with an equal weight of sodium bicarbonate, 2 ml of PolyAqua[6], and about 5 to 7 g/liter NaCl. Water temperature of the anesthetic solution was monitored during PIT implant sessions and maintained within 2°F. Upon sedation, fish were placed with their ventral surface facing up in a foam tagging cradle which supported the entire body of the fish and was saturated with a recovery solution containing PolyAqua and 0.5 to 0.9% NaCl. The injector needle tip was gently inserted posteriorly into the abdomen of the salmon at a point just posterior to the pectoral girdle to create an incision. The PIT tag was pushed from the barrel of the injector needle through the incision simultaneously as the needle was retracted from the incision leaving the PIT tag in the peritoneal cavity (Figure 4). The PIT identifier code number, read with an AVID multi-tag reader, along with a tagging quality code ranging from 1 for good to 5 for poor were recorded for each fish tagged. Fish were immediately placed in a 20-liter recovery bucket containing an aerated solution of 3 ml PolyAqua and about 5 to 7 g/liter NaCl. Upon regaining equilibrium and stable ventilation, fish were placed in a raceway at MRFI and held there for more than one week prior to release to ensure full recovery from the surgical procedure. Test fish were transported in an aerated tank and released at a variety of locations in Lake Lodi (Figure 5). Upon recapture in the fish traps at Woodbridge Dam, the PIT tag codes were recorded with the AVID reader.

Radio-Telemetry: Assessment of Yearling Steelhead Migration Behavior

To complement the PIT tagging assessment of individual fish migration, radio-telemetry was employed utilizing juvenile steelhead. All steelhead used for this assessment were age 1+ fish

[6]Kordon/Novalek, Hayward, CA

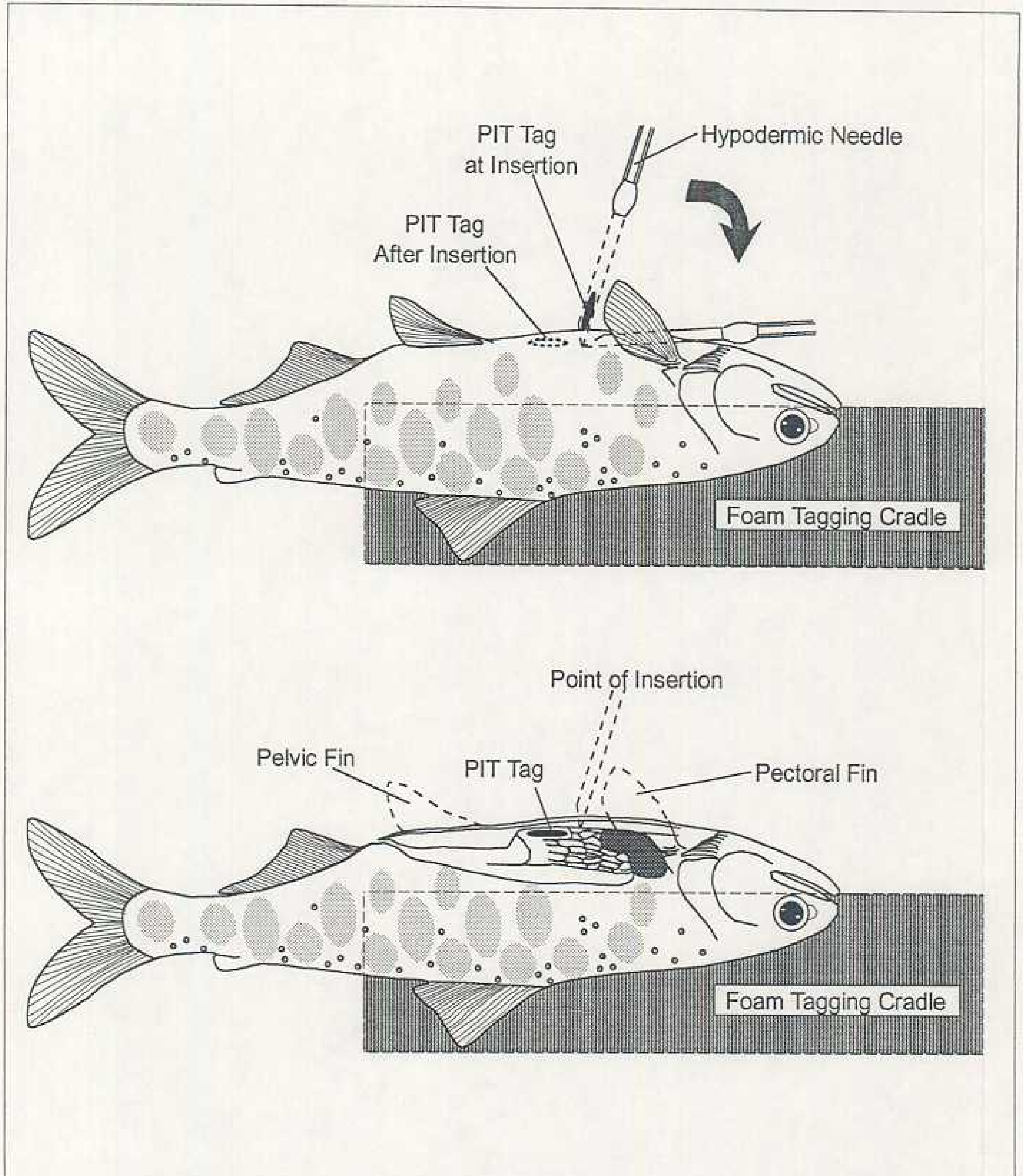

Figure 4. Illustrated implantation of a PIT tag in an anesthetized juvenile chinook salmon, showing point of insertion through the body wall musculature (cutaway view), needle injection angle to implantation site, and position of the implanted PIT tag within body cavity. (Adapted from Prentice et al. 1990)

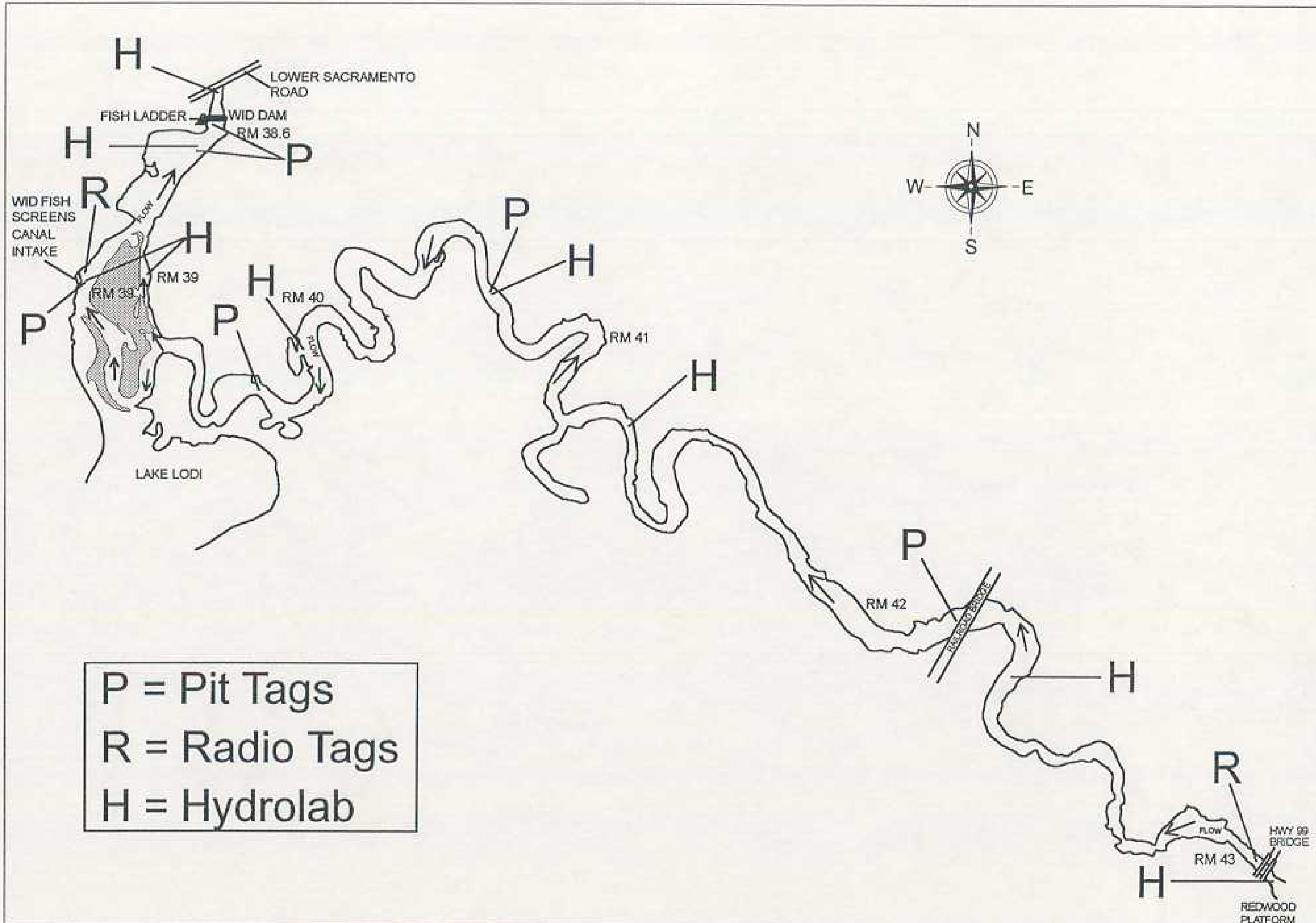

Figure 5. Topographical view of the Mokelumne River and Lake Lodi depicting release sites of PIT- and radio-tagged chinook salmon, and locations of Hydrolab sampling sites.

obtained from MRFI. A 1.8 g "smolt-sized" radio transmitter tag[7] was used for either external attachment or internal implantations.

External attachment utilized a tag harness constructed of a small plastic plate (2 cm x 0.4 cm) with a piece of 2/0 surgical stainless steel suture wire bent in a U-shape with the ends of the wire passed through small holes in either end of the plastic plate. The plastic plate and suture wire assembly was firmly attached to the transmitter so that the ends of the wire protruded about 10 cm perpendicularly from the harness and tag. Heat-shrink tubing cut to fit the length of the plate and transmitter and cyanoacrylate adhesive were used to secure harness assembly to the transmitter . A second plastic plate identical in dimensions and in location of the holes to that previously described was used as a back plate to externally secure the transmitter harness assembly to the fish. Internal implantation required no modification of the transmitter tag.

Because of the surgical nature of the radio tagging procedure, fish were tagged at the hatchery where water temperature was cooler than at Woodbridge Dam and transport stresses could be avoided prior to tagging. Fish were anesthetized individually in aerated solutions containing 100 mg/liter 2,2,2 tricaine methanesulfonate buffered with an equal weight of sodium bicarbonate, 2 ml of PolyAqua, and about 7 g/liter NaCl. Water temperature of the anesthetic solution was monitored and maintained within 2°F.

For external attachment of the transmitter, upon sedation fish were placed dorsum up in a foam tagging cradle which supported the entire body of the fish and was saturated with a recovery solution containing river water, PolyAqua, and 0.9% NaCl. All surgical equipment and the tag-harness suture wire were disinfected with a Betadine solution and rinsed with physiological saline before radio-tagging each fish. Two 18-gauge hypodermic needles (spaced 1.7 cm apart) were pushed through the dorsal musculature approximately 1.5 cm ventral to the dorsal fin. The ends of the suture wire protruding from the tag-harness assembly were threaded through the hypodermic needles and the needles were then withdrawn leaving the suture wire-harness-transmitter assembly in place (antenna pointing toward the posterior of the fish). A neoprene pad, followed by the plastic back plate, were threaded on the ends of the wires, snugged gently against the body of the fish, and the ends of the wires were twisted (8-10x) to secure and complete the external attachment of the transmitter to the fish. The fish's buccal cavity (mouth and gills) was irrigated with the anaesthetic solution at 10 to 15 second intervals with a common meat basting bulb throughout the attachment procedure. After tagging, the fish was placed in a 20 liter recovery bucket containing an aerated solution of river water, 3 ml PolyAqua and about 5 to 7 g/liter NaCl. The entire tagging procedure from removal of the fish from the anesthetic solution to placing the fish in the recovery solution took from 30 to 60 seconds.

For internal implantation, the same fish handling procedure was followed except that fish were placed ventral surface up in the tagging cradle and a small 0.5 to 0.8 cm incision was made 2

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[7]Advanced Telemetry Systems, Inc., Isanti, MN

mm lateral to the mid-ventral line just anterior to the pelvic girdle. The unharnessed transmitter was disinfected with Betadine and rinsed with physiological saline prior to inserting it gently through the incision into the peritoneal cavity of the fish. The antenna was left protruding from the incision. The incision was immediately closed with 3 or 4 cuticular monofilament nylon sutures (5/0 Ethilon). After closure, the incision area was rinsed with physiological saline and the fish was placed in a recovery bucket as previously described. The fish's buccal cavity was irrigated with anaesthetic solution as previously described during the surgery. The internal implantation procedure took between 1.5 to 2 minutes.

Fish were transported to Woodbridge Dam 1 to 2 hours after recovery in a 125 liter insulated plastic fish hauling box[8] with bottled oxygen aeration (1-2 liters/minute). River water obtained at the hatchery with approximately 0.7-0.9% salt (NaCl added), 15ml PolyAqua, and ice to control temperature was used as the transportation medium to minimize osmotic and handling stress during transport. Upon arrival at the dam fish were acclimatized to the river water temperature by tempering at a rate of 2°F per 15 minutes. Fish were placed in pairs in 25 liter cylindrical PVC live cars and held overnight in the refuge area located in low-stage fishway pool #5a. After overnight acclimation to the water quality at Woodbridge Dam, fish were transported in the 125 liter fish hauling box (as previously described) and released at various locations within Lake Lodi (Figure 5).

Radio-tagged juvenile steelhead movements were monitored using mobile reconnaissance and a fixed-station located at Woodbridge Dam. Both techniques utilized Advanced Telemetry Systems, Inc. scan receivers (model ATS R2100). Mobile reconnaissance was conducted from a boat and from shore using a directional loop antenna to locate radio tagged fish. Radio reconnaissance surveys were conducted one to four times daily when radio tagged fish were at large after release. Each time a radio tagged fish was located during a reconnaissance survey, radio frequency identification number, location, time, and any relevant biological and behavioral observations were recorded on aerial photographic representations of the Lake Lodi reach of the river.

Fixed station monitoring was conducted using a scan receiver connected to an ATS DCC II datalogger (Advanced Telemetry Systems, Inc.). The receiver-datalogger system scanned radio tag frequencies programmed into the datalogger and recorded their reception/occurrence when tagged fish entered a specified and limited area within about 100 m upstream of Woodbridge Dam. To control the size of the desired radio reception area, a directional Yagi antenna was used in combination with a tuning/test transmitter (located in 2 m of water at the farthest radius of the desired reception region) and the gain/range controls of the scanning receiver.

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[8]Coleman Ice Chest, Witchita, KS

Water Quality Monitoring in Lake Lodi and the Mokelumne River

Water quality monitoring occurred at various locations in Lake Lodi and the Mokelumne River (Figure 5) on one day in the afternoon during each week from May 26, to July 25, 1994. Nine monitoring sites were established from river mile 43.25 to river mile 38.5. Each site was located one river mile or less from adjacent sites. Measurements were taken at the same locations each week using a Hydrolab[9] H20 Multiparameter Water Quality Data Transmitter and Surveyor 3 Display Logger. Water quality parameters monitored included: dissolved oxygen, percent saturation, temperature, specific conductance (conductivity), redox, and pH. At each location where sufficient water depth occurred, measurements were taken at the surface and every three feet in depth to the river bottom to obtain water column profile data. Standard methods for calibration, post calibration, maintenance, and data recovery from the instruments were employed as described in the Hydrolab instrument operating manual.

Physiological Monitoring of Smoltification of Fall Chinook Salmon

This task element was conducted at a pilot level of effort to assess the usefulness of gill Na^+/K^+ ATPase measurements from field-collected naturally produced chinook salmon to characterize an aspect of the smoltification process and for detecting fish responses to environmental conditions. At two-week intervals from March through July 1994, young-of-year fall chinook salmon were collected from rearing habitat between river miles 53 and 70 (Elliott Road Bridge to the Public Day Use Area at MRFI, respectively) and Woodbridge Dam. Collections from both reaches were made within one day of the other to minimize any temporal variations in measured parameters between groups collected in the different river reaches. Fish collected from the rearing habitat were assumed to be primarily in the rearing life stage; while fish collected at Woodbridge Dam were assumed to be actively migrating smolts. Collections in the rearing reach were made by beach seining with a 20 m x 1.5m x 2mm Delta mesh nylon seine. Collections at Woodbridge Dam were sampled from fish captured in the downstream migrant traps deployed there. Six to ten fish were sampled from each location on each collection date. Fish were euthanized individually as processed using a 200 - 250 mg/liter solution of 2,2,2 tricaine methanesulfonate buffered with bicarbonate. Fish were measured for TL, FL, and weighed as previously described. Gill filaments were carefully excised from all individual gill arches and placed in a 2ml vial of a fixative solution of sucrose, EDTA, and imidazole and frozen on dry ice. Samples were kept frozen at -18 to -25°F until shipped to a laboratory for processing[10]. The samples were homogenized and analyzed using the whole homogenate method for determining Na^+/K^+ ATPase activity (Johnson *et al.* 1977). The resulting data were subjected to analysis of variance (Neter and Wasserman 1974) to assess spatial and temporal differences and changes in gill Na^+/K^+ ATPase profiles among the groups of fish sampled.

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[9]Hydrolab Corporation, Austin Texas

[10]BioTech Research and Consulting, Inc., Corvallis, OR

RESULTS AND DISCUSSION

Abundance of Downstream Migrant Juvenile Salmonids

Trapping was conducted for a total of 71 days between October 21 and December 31, 1993 (primarily for yearling fall chinook salmon released at MFRI) and for a total of 212 days between January 1 and July 31, 1994 at Woodbridge Dam. Trapping was essentially continuous during the course of the entire season at Woodbridge Dam. Appendices 1 and 2 provide complete daily records of trapping effort and the capture numbers of young-of-year and yearling fall chinook salmon. The overall trapping numbers of juvenile salmonids during the 1993-94 monitoring season are presented in Table 2. As in previous years, juvenile chinook salmon were by far the most abundant species captured throughout the monitored period. The most abundant non-salmonid species were comprised of several introduced centrarchid fishes (sunfish family) and introduced cyprinids (minnow family). Seven adult smelt of the genus *Hypomesus* were captured during January through March. No differentiation of these smelt between wakasagi and Delta smelt could be performed in the field and they were carefully released alive when captured in the rotary traps. The monthly numbers of these species and others captured at the Woodbridge Dam downstream migrant trapping station are shown in Table 3. In general, most of those species captured (e.g., centrarchids, striped bass, shad, splittail) were sub-adults.

Table 2. Total Numbers of Juvenile Anadromous Salmonids Trapped at the Woodbridge Dam Trap Site During October 1993 through July 1994.

October - December 1993			
Fall-Run Chinook Salmon		**Steelhead**	
YOY	1+	**YOY**	1+
0	5628	0	20
January - July 1994			
Fall-Run Chinook Salmon		**Steelhead**	
YOY	1+	**YOY**	1+
9014	1229	34	84

Table 3. Monthly Capture of Incidental Species at the Woodbridge Dam Trap Site During October 1993 through July 1994.

Species	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July
Pacific Lamprey (*Lampetra tridentata*)	1	0	1	0	3	12	2	0	1	0
Sacramento Sucker (*Catostomus occidentalis*)	0	10	1	0	1	1	1	6	2	2
Bluegill (*Lepomis macrochirus*)	27	702	275	89	11	34	591	623	47	65
Largemouth Bass (*Micropterus salmoides*)	1	20	14	5	1	0	3	627	548	0
Smallmouth Bass (*Micropterus dolomieui*)	5	6	0	0	1	0	1	0	0	0
Striped Bass (*Morone saxatilis*)	0	0	0	0	0	0	0	0	1	0
Spotted Bass (*Micropterus punctulatus*)	0	0	0	0	0	0	0	0	730	0
Redear Sunfish (*Lepomis microlophus*)	1	7	10	12	1	3	15	9	5	0
Green Sunfish (*Lepomis cyanellus*)	0	0	1	0	1	3	7	0	0	0
Unidentifiable Centrarchid Species (e.g., hybrids, too small to I.D. in field)	0	40	0	0	0	4	1	0	99	2422
Prickly Sculpin (*Cottus asper*)	0	13	0	29	173	90	28	19	12	36
White Crappie (*Pomoxis annularis*)	12	141	125	40	5	5	19	8	1	0
Black Crappie (*Pomoxis nigromaculatus*)	0	62	12	1	1	0	1	0	0	0

Table 3. Monthly Capture of Incidental Species at the Woodbridge Dam Trap Site During October 1993 through July 1994 (Continued).

Species	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July
Channel Catfish (*Ictalurus punctatus*)	0	5	3	0	1	0	0	0	0	0
White Catfish (*Ameiurus catus*)	0	0	0	0	0	0	0	0	0	3
Brown Bullhead (*Ameiurus nebulosus*)	0	0	0	0	0	0	0	0	0	1
Carp (*Cyprinus carpio*)	0	24	8	4	1	0	0	12	10	9
Hardhead (*Mylopharodon conocephalus*)	0	0	0	0	0	0	0	0	1	0
Golden Shiner (*Notemigonus crysoleucas*)	2	60	44	48	16	17	1	1	0	2
Hitch (*Lavinia exilicauda*)	0	1	1	21	8	9	0	0	0	0
Sacramento Squawfish (*Ptychocheilus grandis*)	0	0	1	1	0	0	0	0	8	0
Unidentifiable Cyprinid Species (e.g., too small to accurately I.D. in field)	0	0	0	0	0	0	0	0	4	1
Inland Silverside (*Menidia beryllina*)	5	54	0	0	0	2	9	1	0	0
Rainbow Trout/Steelhead (*Oncorhynchus mykiss*)	5	13	2	5	35	4	5	12	24	33
American Shad (*Alosa sapidissima*)	0	1	3	0	0	0	0	0	0	0

Table 3. Monthly Capture of Incidental Species at the Woodbridge Dam Trap Site During October 1993 through July 1994 (Continued).

Species	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July
Threadfin Shad (*Dorosoma Petenense*)	0	0	0	0	1	0	1	0	0	0
Bigscale Logperch (*Percina macrolepida*)	0	5	0	0	1	0	0	0	0	1
Tule Perch (*Hysterocarpus traski*)	0	1	0	0	2	2	0	0	3	8
Smelt (*Hypomesus spp.*)	0	0	0	1	5	1	0	0	0	0
Splittail (*Pogonichthys macrolepidotus*)	0	0	0	0	4	0	0	0	0	0
Pumpkinseed (*Lepomis gibbosus*)	0	0	0	0	0	0	0	1	0	0
Mosquitofish (*Gambusia affinis*)	0	0	0	0	0	0	0	0	5	0
Unidentifiable Larval Fish	0	0	0	0	0	0	0	2	0	0

A relative temporal abundance index for young-of-year fall chinook salmon passing Woodbridge Dam was generated based on the results of trap efficiency tests conducted at nine intervals throughout the season (see Table 1). From January 15 through July 31, 1994, an estimated 143,224 naturally produced young-of-year chinook salmon passed the Woodbridge Dam trap site. No statistical confidence interval for this estimate could be constructed from the data set because of variable environmental conditions during the time periods that were initially intended to serve as replicate trap efficiency tests. However, distinct differences between paired day and night trapping efficiency tests were detected by the analyses and abundance estimates were subsequently stratified by day and night time periods to improve resolution of the overall abundance estimate. Based on the stratified diurnal/nocturnal trapping efficiencies, it was estimated that about 70,600 (day) and 72,600 (night) young-of-year salmon passed Woodbridge Dam. The daily diurnal and nocturnal estimates of abundance, associated mean trap efficiencies, and the periods of estimation used to compute the overall abundance estimate are provided in Appendix 3. Figures 6 and 7 display the temporal distribution of daily estimated abundance and aggregated weekly estimates of abundance for young-of-year salmon passing the Woodbridge Dam trap site.

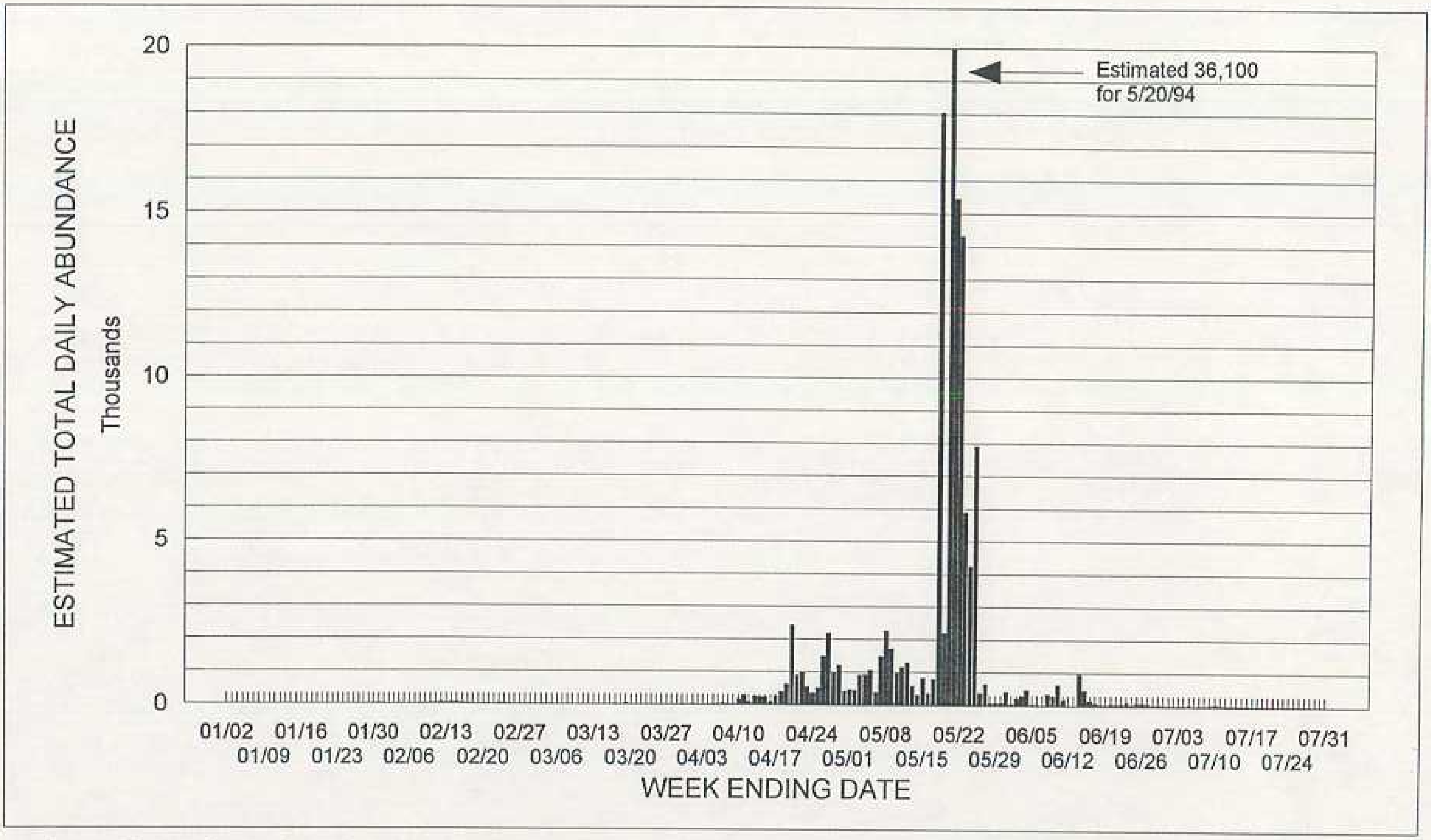

Figure 6. Estimated total daily abundance of young-of-year chinook salmon passing Woodbridge Dam during January through July 1994.

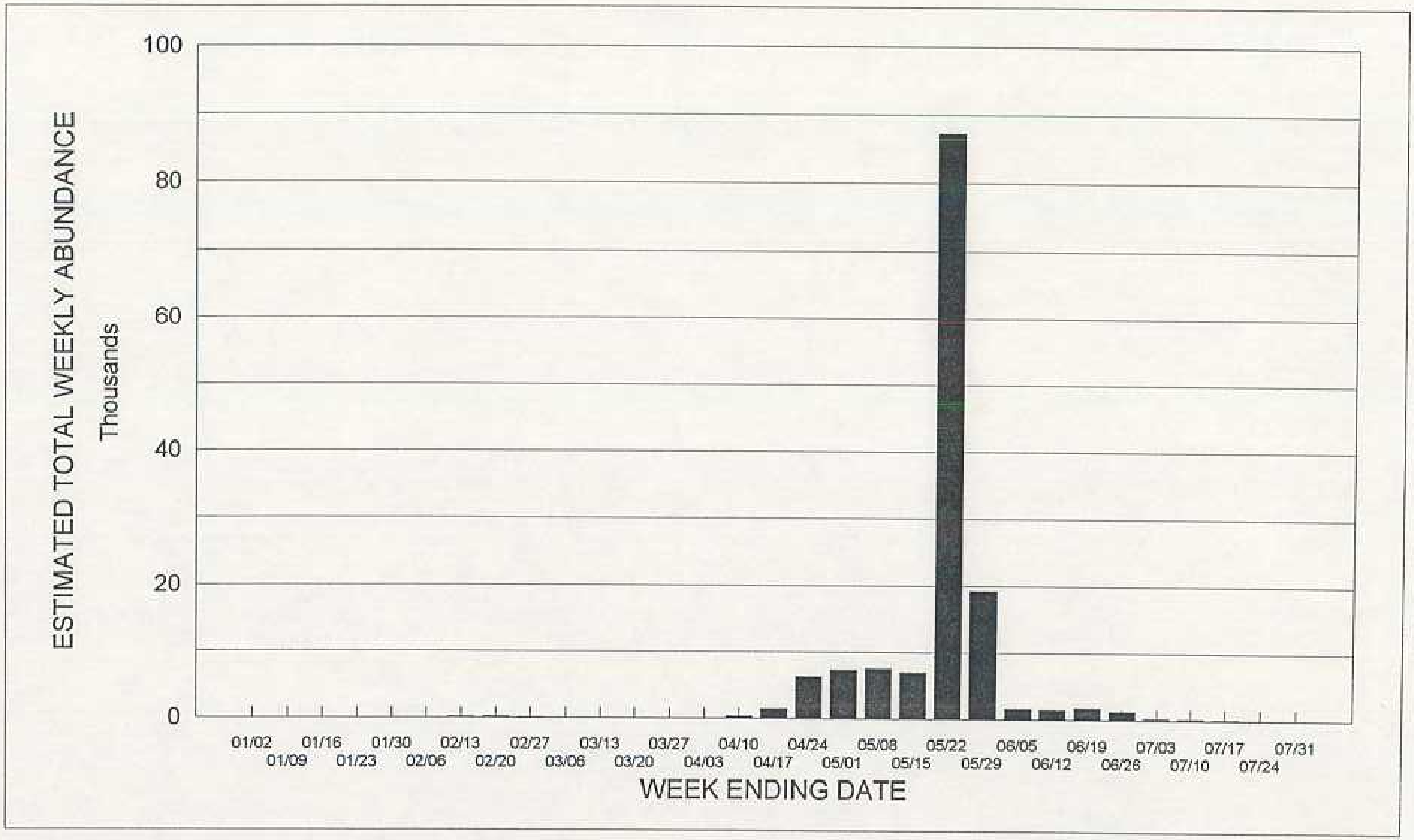

Figure 7. Estimated total weekly abundance of young-of-year chinook salmon passing Woodbridge Dam during January through July 1994.

Timing of the Downstream Migration of Juvenile Salmonids

As Figures 8 and 9 show, the majority of the 1993 brood of fall chinook salmon emigrated from the lower Mokelumne River during the months of April and May in 1994. Substantial increases in daily counts at Woodbridge Dam were observed beginning in the second and third week of April. The increased trap capture numbers were comprised almost exclusively of smolt-sized fish. This appeared to signal the beginning of a purposeful downstream smolt migration (Figure 9).

Very few fry-sized (TL≤50 mm) salmon were captured passing Woodbridge Dam and abundance estimates indicated that few naturally-produced salmon emigrated past Woodbridge Dam as fry during 1994. It is common to observe some proportion of a juvenile chinook salmon population to disperse downstream from the spawning grounds shortly after emergence (Healey 1991, Kjelson *et al.* 1982). Hydrologic conditions have been observed to have a great influence on the magnitude of the fry emigration in the Sacramento River with a greater proportion of fry emigrating from upstream river reaches during wet winters with high river flows than during drier years (Vogel *et al.* 1988). However, the destiny of these early migrating fry varies among populations, according to Healey (1991); while some migrate directly to estuaries, others may simply relocate to other suitable freshwater rearing habitat along the river's length. From the estimates of the weekly abundance of young-of-year salmon passing Woodbridge Dam shown in Figure 7, it can be seen that only a small proportion of the annual natural production (<1% through the week of April 10) moved below Woodbridge Dam and potentially to the estuary during this early fry migration. Therefore, most of the 1993 brood year reared to smolt size in the river reaches upstream from Woodbridge Dam.

Figure 10 provides the weekly trap counts of young-of-year and yearling chinook salmon and steelhead during January through July 1994. No estimates of total abundance for yearling salmon were made because no yearling salmon were available at this time of year for conducting trap efficiency tests. Observations on yearling salmon occurrence in the traps were possible and they were present through the week of May 15; however, not in great numbers. Steelhead were not very numerous at any time during the season. Yearling and some potentially age 2+ steelhead (>200 mm TL) were captured early in the season.

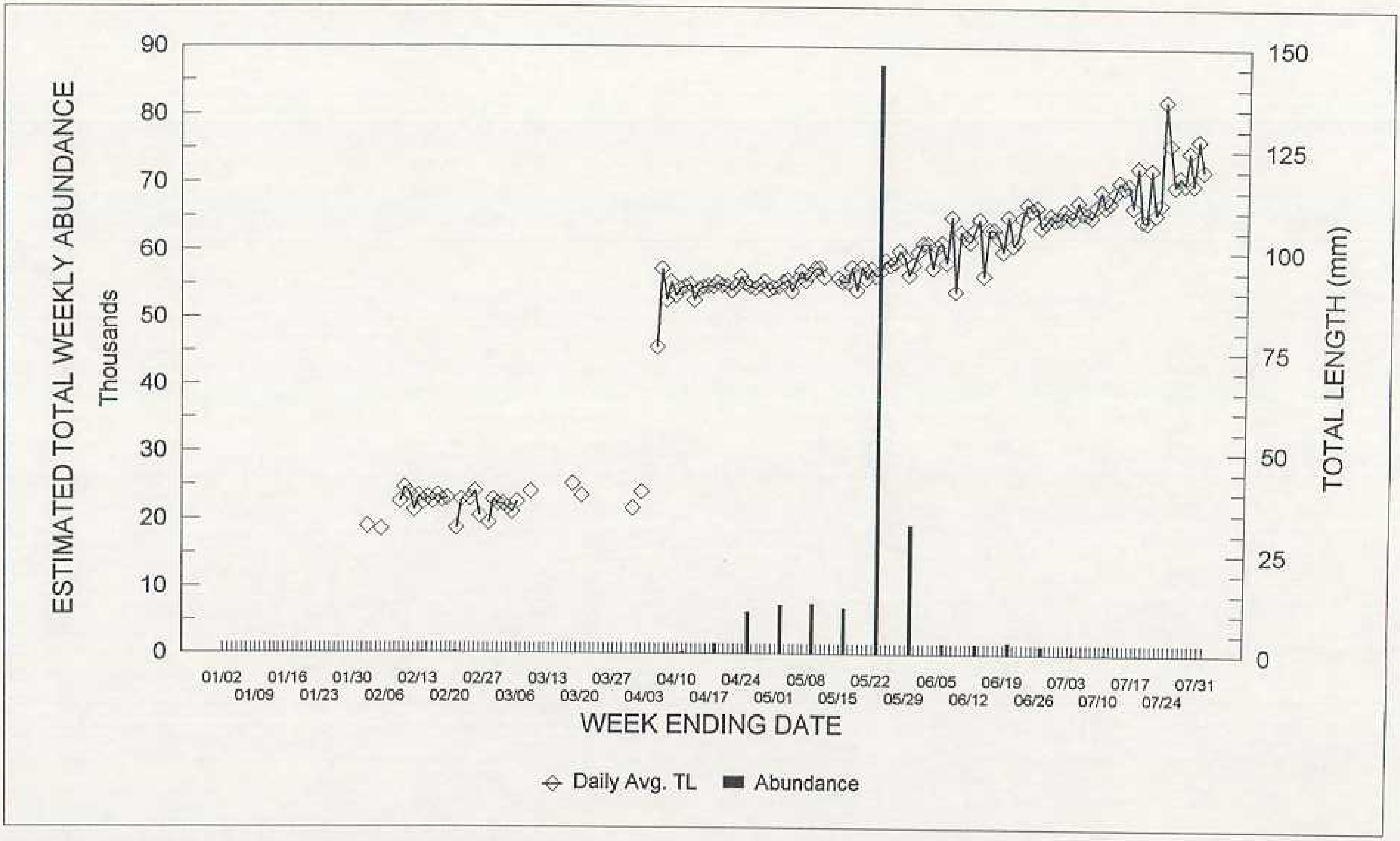

Figure 8. Timing of total estimated weekly abundance and size of downstream migrant young-of-year chinook salmon passing Woodbridge Dam during January through July 1994.

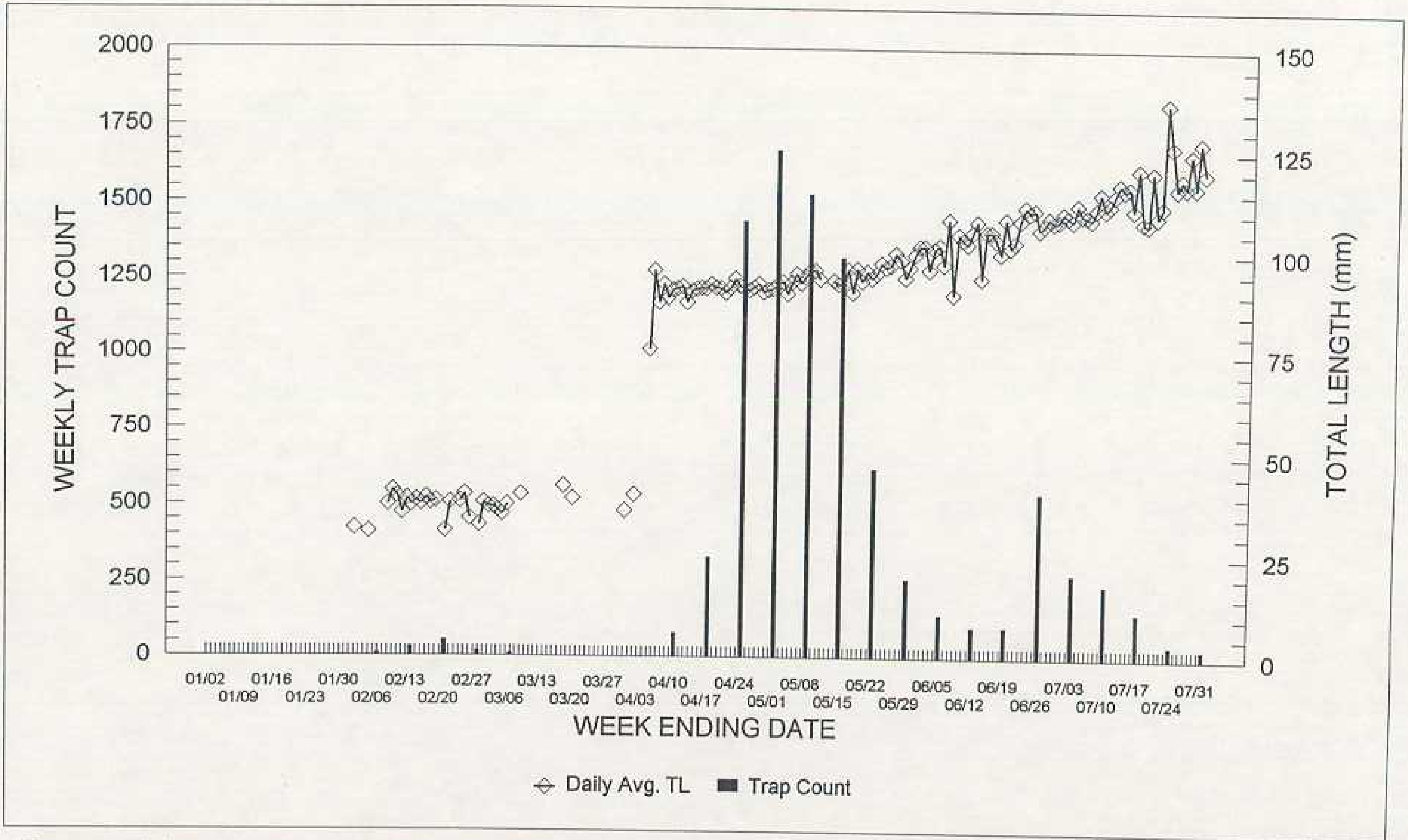

Figure 9. Timing and size of downstream migrant young-of-year chinook salmon passing Woodbridge Dam during January through July 1994.

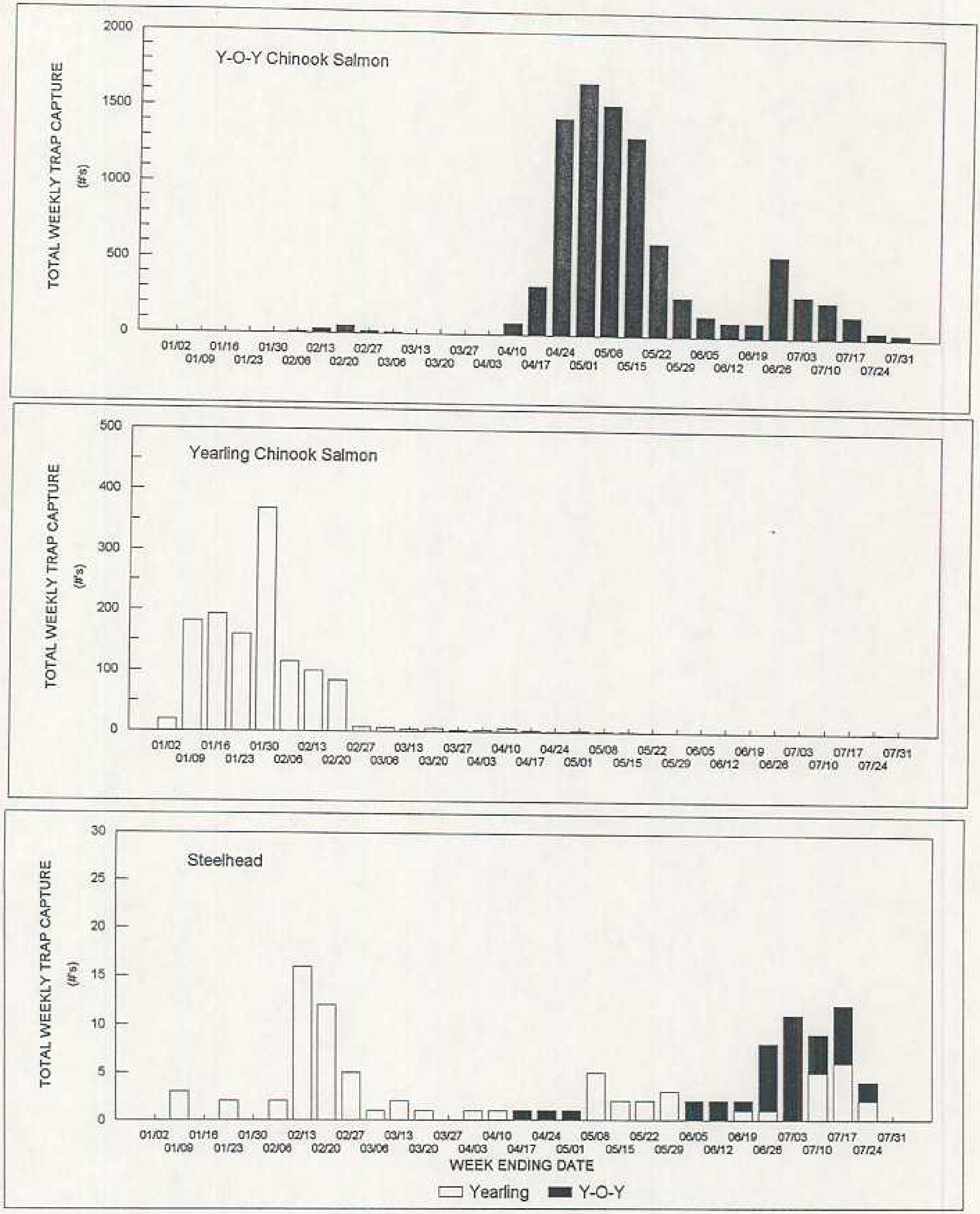

Figure 10. Weekly counts of juvenile chinook salmon and steelhead trapped at the Woodbridge Dam on the Mokelumne River during January through July 1994.

Size and Condition of Downstream Migrant Salmon

Daily records of average TL, FL, weight, and condition factor, as well as the range in size measurements of young-of-year and yearling salmon captured at Woodbridge Dam are provided in Appendices 4 and 5. Figures 11 and 12 show the mean fish size and range of size over the duration of the seasons that young-of-year and yearling salmon were captured. The majority of young-of-year salmon captured at Woodbridge Dam were captured as smolt-sized salmon. The size criteria for separating fry and smolt chinook salmon are based on size at smoltification data for chinook salmon reviewed by Healey (1991); none exists specifically for the Mokelumne River fall chinook salmon stock. Based on the abundance estimates for downstream migrant young-of-year salmon passing Woodbridge Dam, more than 99% emigrated as smolts during 1994. The size and number of young-of-year salmon increased abruptly during the second week in April signalling the onset of the smolt emigration. The size of smolts increased gradually for the duration of the season after the onset of emigration. The mean size of yearling salmon observed passing Woodbridge Dam remained primarily in the range of 150 mm TL to 175 mm TL during the period when they were observed in greatest abundance; although, the size of these fish ranged from about 75 mm TL to over 200 mm TL over the same period from October 1993 through February 1994.

The weight and condition factor of migrating young-of-year salmon followed a similar pattern to that of changes in TL (Table 4). Weight increased slightly during the fry migration ranging from 0.2 to 0.4 grams in average weight with average condition factors ranging from 4.49×10^{-4} to 5.58×10^{-4}. The abrupt occurrence of smolts in the traps affected increases in averages and standard deviations for weight and condition factor as it did for TL. The weight and condition factor of smolts migrating by Woodbridge Dam generally increased throughout the smolt migration. Late in the season, during June and July, a decrease was observed in the condition factors of migrating smolts. This phenomenon may have been the result of higher metabolic requirements of the fish associated with warmer water temperatures occurring late in the season.

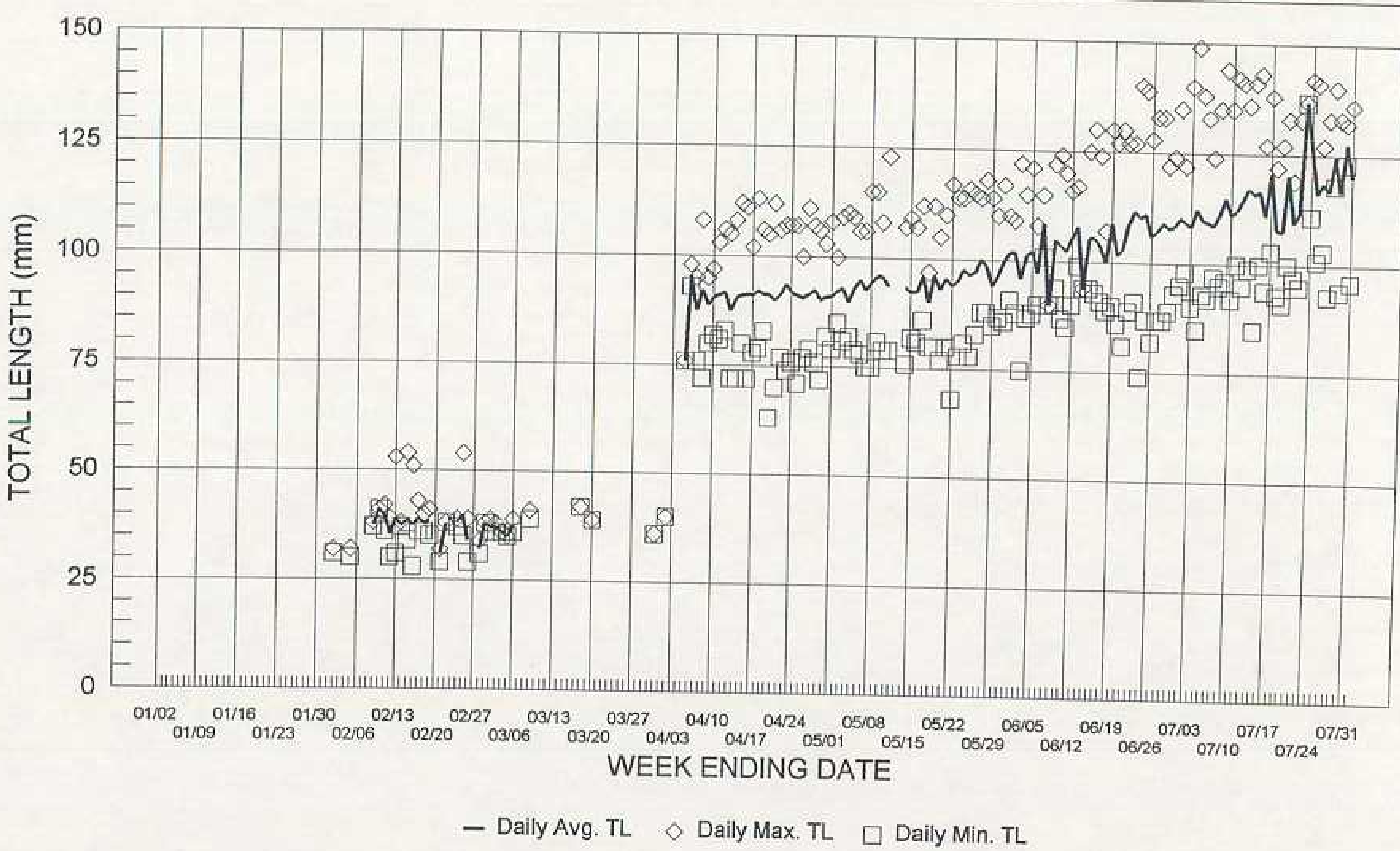

Figure 11. Daily average, maximum, and minimum total lengths of young-of-year chinook salmon captured at Woodbridge Dam during January through July 1994.

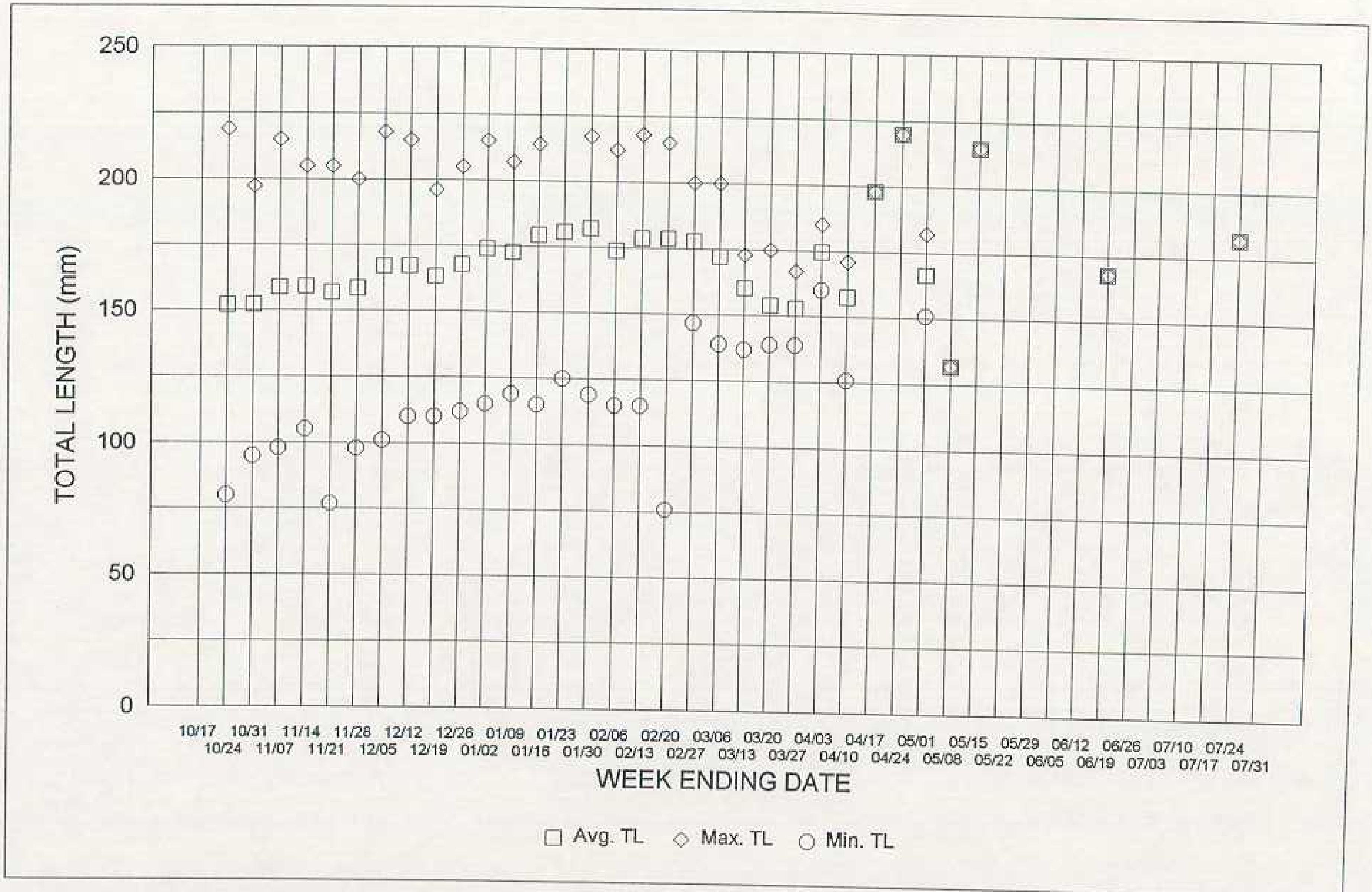

Figure 12. Weekly average total length and range in size of yearling chinook salmon captured in rotary screw fish traps and downstream migrant traps installed in the fishways at Woodbridge Dam during the period October 1993 through July 1994.

Table 4. Weekly Average Total Length, Range in Lengths, Weight, and Condition Factor for Young-of-Year Chinook Salmon Captured at Woodbridge Dam During the Period of January through July 1994.

WEEK ENDING DATE	AVGTL (mm)	STDTL (mm)	MAXTL (mm)	MINTL (mm)	AVGWT (g)	STDWT (g)	AVGK	STDK	N
01/02/94									0
01/09/94									0
01/16/94									0
01/23/94									0
01/30/94									0
02/06/94	31	0.9	32	30	0.2	0.08	0.000551	0.000253	6
02/13/94	38	3.5	53	30	0.3	0.2	0.000492	0.000145	30
02/20/94	38	4.3	54	28	0.3	0.2	0.000472	0.000133	50
02/27/94	37	6	54	29	0.3	0.26	0.000558	0.000195	17
03/06/94	37	2.3	39	35	0.3	0.01	0.000496	0.000094	10
03/13/94	40	1.4	41	39	0.3	0	0.000471	0.00005	2
03/20/94	41	2.1	42	39	0.4	0.21	0.000506	0.000239	2
03/27/94									0
04/03/94	38	2.8	40	36	0.3	0.07	0.000449	0.000028	2
04/10/94	91	6.8	108	72	5.9	1.28	0.000782	0.000056	66
04/17/94	91	7.5	113	72	5.8	1.48	0.000768	0.000048	197
04/24/94	91	7.2	112	63	6	1.4	0.000771	0.000052	282
05/01/94	91	6.6	111	72	6	1.35	0.000773	0.000059	277
05/08/94	93	7	115	75	6.5	1.54	0.000778	0.000052	293
05/15/94	94	6.4	123	76	6.5	1.46	0.000783	0.000045	235
05/22/94	95	7.8	117	68	7	1.79	0.000801	0.000052	280
05/29/94	97	7.8	118	78	7.5	1.85	0.000794	0.000053	226
06/05/94	100	8.7	122	75	8.1	2.16	0.000797	0.000053	136
06/12/94	104	9.2	124	85	9.2	2.48	0.000804	0.000062	96
06/19/94	104	9.3	130	86	9.3	2.93	0.000796	0.000061	99
06/26/94	109	9.3	140	74	10.8	2.9	0.000823	0.00006	345
07/03/94	109	9.7	149	85	10.7	3.1	0.000802	0.000053	249
07/10/94	111	10.3	144	92	11.3	3.49	0.000794	0.000074	182
07/17/94	116	11.1	143	85	12.8	3.99	0.000799	0.000051	147
07/24/94	116	13.1	142	91	8.2	4.46	0.000529	0.000058	41
07/31/94	120	13.3	140	93	14.1	4.61	0.000792	0.000062	31

Effects of Physical Environmental Conditions on Downstream Migrants

Diel Periodicity of Fish Migration Past Woodbridge Dam

The effects of photoperiod (day length) on the physiology of salmonid smoltification and salmonid migration behavior, particularly at passage obstacles such as dams, are well documented (Banks 1969, Greenstreet 1992, Hoar 1988, Long 1959, McKeown 1984, Vogel *et al.* 1988). The diel hourly patterns of migration of smolt-sized chinook salmon passing Woodbridge Dam were documented on two occasions in May 1994 during the height of the smolt emigration. These results are shown in Figure 13. The temporal patterns of diel migration were similar during both surveys. The greatest movements of chinook salmon smolts occurred during the night time and early morning daylight hours.

The diel water temperature cycle in the lower Mokelumne River may partially influence the observed diel periodicity of migratory behavior. Average daily water temperatures during the month of May were generally in the 60°F's. Daily maximum temperatures were in the mid to upper 60's. The preferred, or optimal physiological, water temperature range for juvenile chinook salmon is considered to be from 50 to 66°F (Brett 1952, Coutant 1977, Piper *et al.* 1982). Generally, the coolest temperatures were experienced during the night time and early morning hours on both survey dates. During periods when day time water temperatures are elevated above the thermal preferenda, or elevated near the upper optimal temperature, migration may be optimized bioenergetically during the time period when water temperatures are coolest. Additionally, when water temperatures are warmest during the day, potential predatory fishes may also be at their most active state (provided the temperatures are not elevated above their physiological optimums and tolerances), and juvenile salmon may migrate at night to minimize their risk of being preyed upon. Higher night time passage of salmon smolts was observed in June 1993 during the dark and cooler hours of night when average daily water temperatures rose into the upper 50's to lower 60's range compared to earlier in May when average daily water temperatures were cooler (Vogel and Marine 1994).

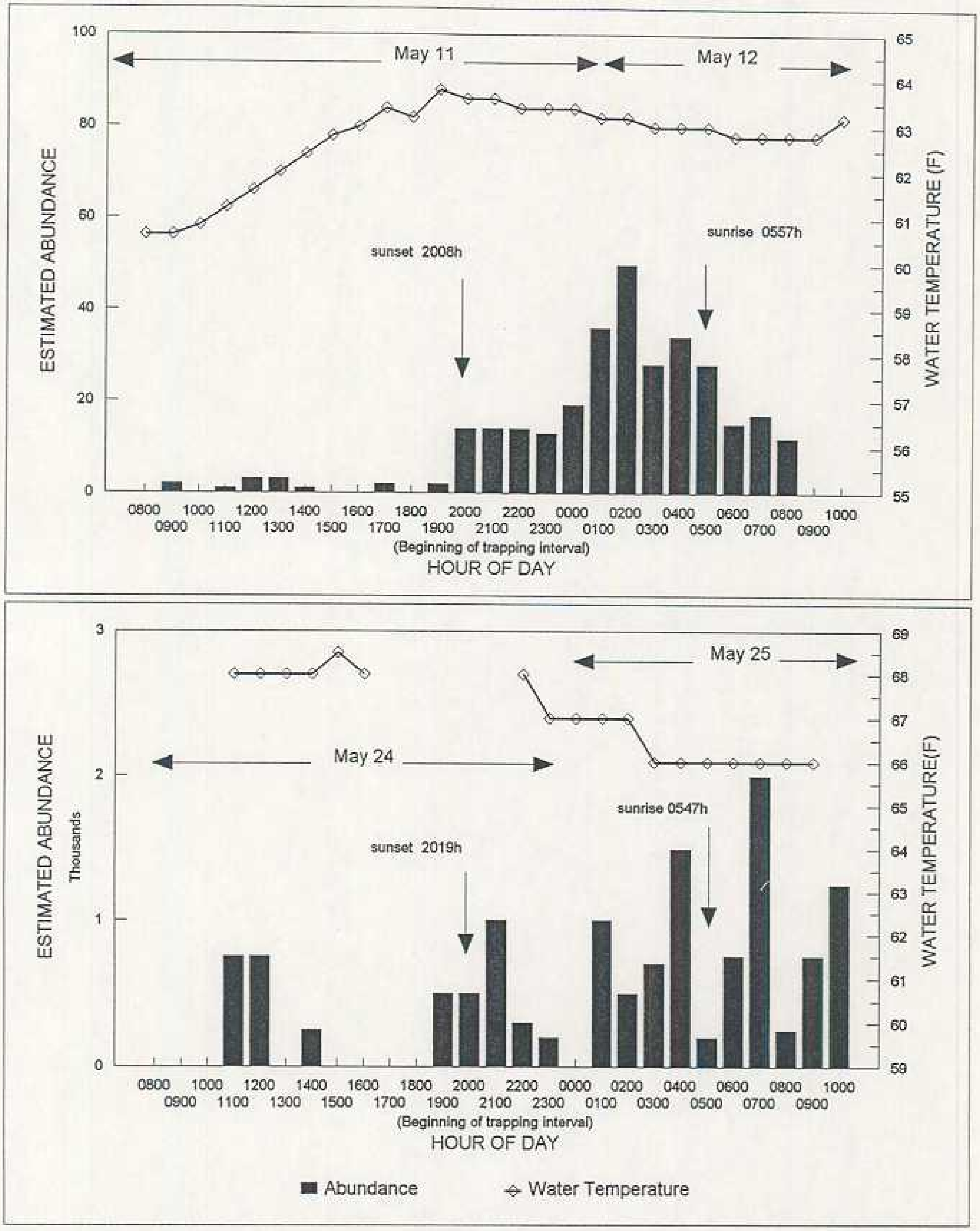

Figure 13. Hourly abundance estimates and corresponding water temperatures for diel surveys of young-of-year fall chinook salmon migration by Woodbridge Dam during May 1994.

Water Temperature, River Flow, Rainfall, Turbidity, and Lunar Phase

Daily average river flow, water turbidity, and surface water temperatures are provided in Appendix 6 for the Woodbridge Dam trap site. Daily rainfall was measured at Camanche Dam by the National Weather Service and is included in the appendix tables.

Figure 14 shows the daily river flow, Woodbridge Canal diversions, and turbidity at Woodbridge Dam. Changes in river flow were primarily related to changes in releases from Camanche Dam. The resulting hydrograph exhibited periods of relatively constant flows punctuated by relatively rapid changes in flow occurring over the course of one or two days. Rainfall caused transient, low magnitude increases in river flow generally lasting less than three to five days. The effects of rainfall at Woodbridge Dam are somewhat accentuated by accretions caused by urban drainage from the city of Lodi (Jim Burgess, EBMUD, personal communication). Turbidity fluctuated widely over the season. Periods of rainfall and subsequent runoff caused transient increases in turbidity as did the pulsed, increased releases from Camanche Dam. Turbidity also could have been a function of algal production in Camanche Reservoir and Lake Lodi that subsequently moves in the river discharges.

Figures 15 and 16 show the hourly and average daily water temperatures recorded at the trapping site. Diel changes in water temperatures were very noticeable from the hourly readings logged at the site (Figure 15). We converted hourly readings or early morning and late afternoon readings to mean daily water temperatures for comparisons to the daily numbers of outmigrant salmon.

Researchers elsewhere have noted that salmon emigrations tend to occur in groups and pulses; these pulses may correspond to increased flow events. For example, USFWS salmon research by Kjelson *et al.* (1982) and Vogel (1989) reported increased downstream movements of fry chinook corresponding to increase river flows and turbidity, respectively. We examined potential migratory responses to these environmental parameters and the potential influence of water temperature, lunar phase, and precipitation. In each case, no general trend or cause and effect relationship was apparent (Figures 17 and 18).

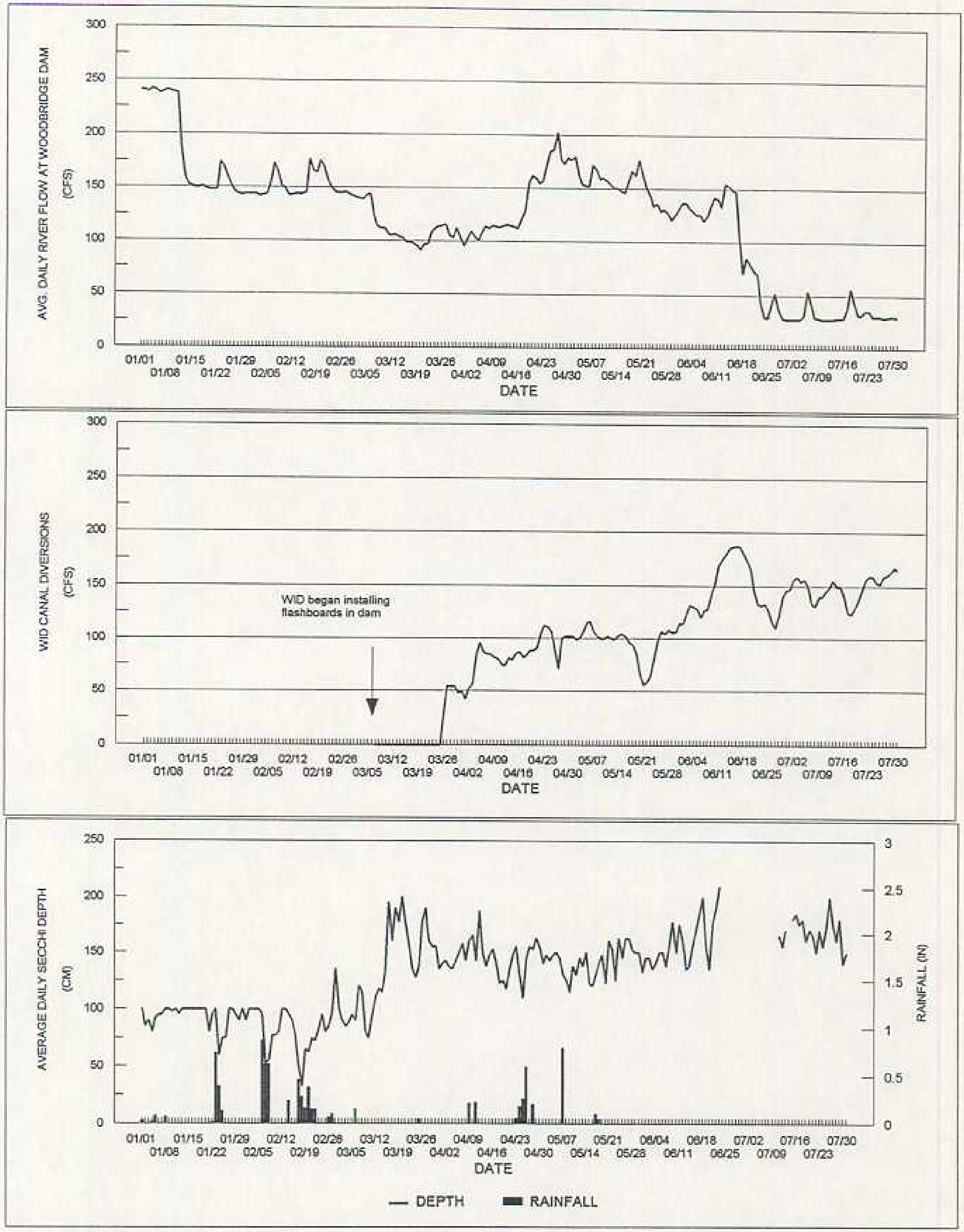

Figure 14. River flow passing Woodbridge Dam, WID canal diversions, daily average turbidity (as measured by Secchi visibility), and rainfall at Woodbridge Dam trap site (RM 39) during January through July 1994.

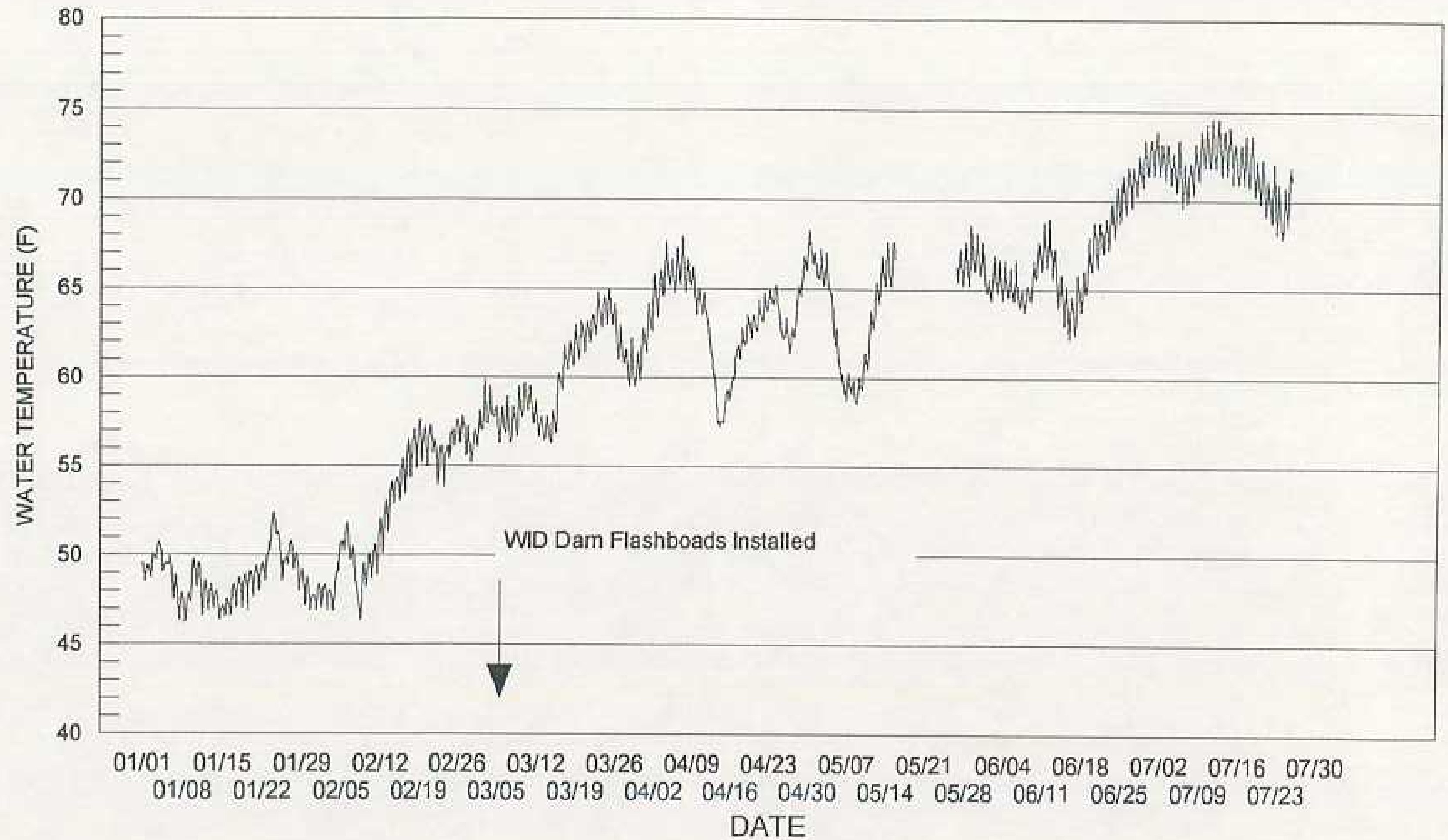

Figure 15. Hourly water temperatures recorded at Woodbridge Dam during January through July 1994.

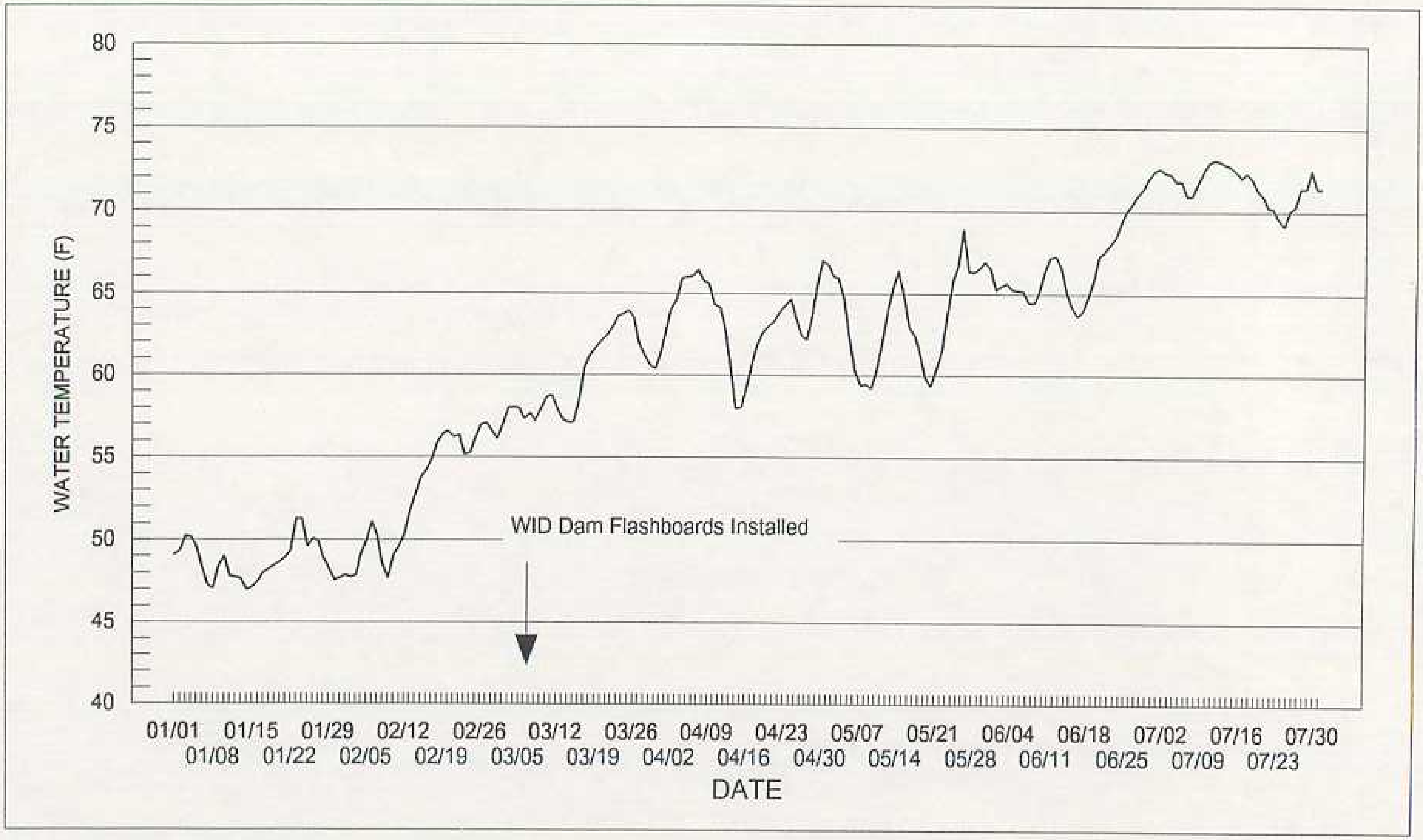

Figure 16. Average daily water temperature of the Mokelumne River at Woodbridge Dam during January through July 1994.

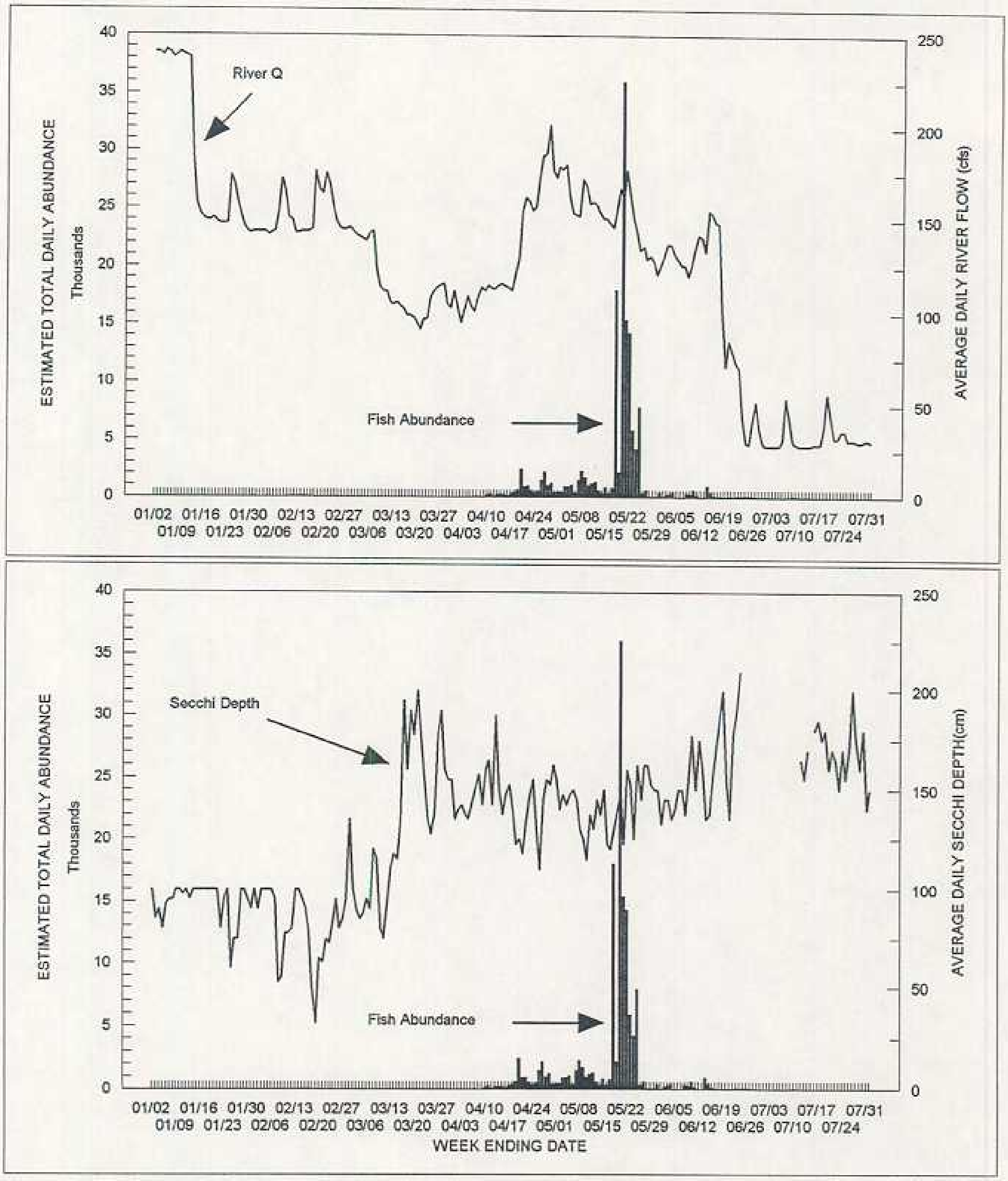

Figure 17. Comparison of estimated total daily abundance of young-of-year chinook salmon passing Woodbridge Dam with average daily river flows passing Woodbridge Dam and water clarity (measured as Secchi depth) during January through July 1994.

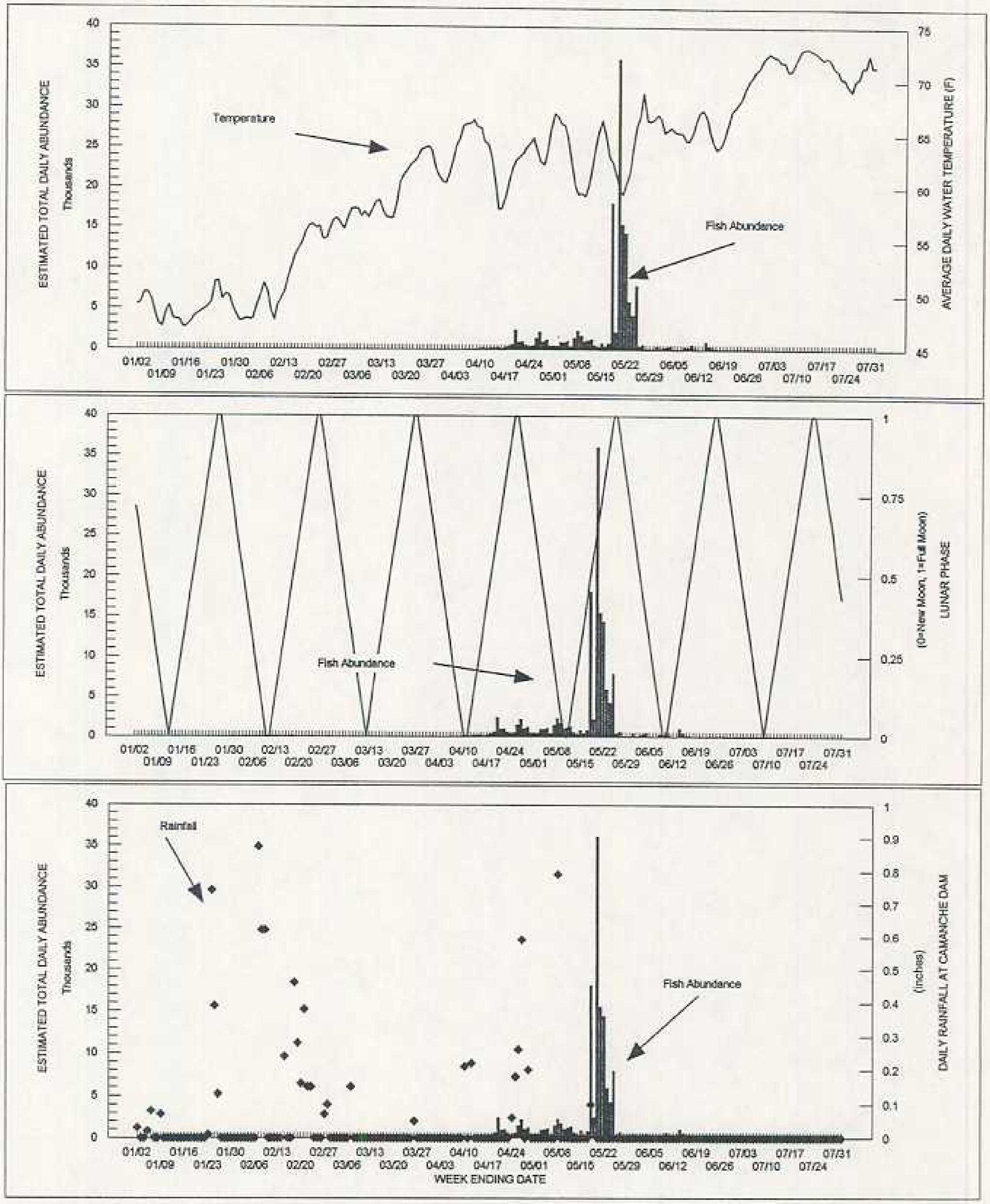

Figure 18. Comparison of estimated daily total abundance of young-of-year chinook salmon passing Woodbridge Dam with daily water temperatures, lunar cycle, and daily rainfall measured during January through July 1994.

Comparison of Juvenile Salmonid Downstream Migration During 1990-1994

Monitoring of juvenile salmon outmigration in the Mokelumne River was conducted during the spring of 1990, 1991, and 1992. The purposes for this monitoring were to determine the age, size and physical condition of the migrants and to identify the environmental variables influencing the migration patterns (Bianchi *et al.* 1992). Unlike the monitoring conducted during 1993 and most of 1994, prior years monitoring of outmigration at Woodbridge Dam relied on downstream migrant traps installed in the two fishways (due to lower flow conditions). Because the monitoring methodologies were not the same, direct comparisons of some data between years is not possible. However, there are some useful comparisons between years which may be made.

As observed in 1993, diel sampling conducted during 1994 showed a diel periodicity of migratory behavior. This crepuscular response pattern was also observed in 1990, 1991, and 1992 by Bianchi *et al.* (1992) in that the greatest movement was seen during the morning twilight hours; however, they did not notice any potential effect of temperature. Their results may have also been affected by conditions at the WID fish screens (Vogel 1992). The 1990 to 1992 studies were all conducted in the month of May when daily water temperature fluctuations were not more than 1.5°C and the influence of temperature may not be as acute. In fact, Greenstreet (1992) proposed a hierarchy of environmental cues eliciting migration of Atlantic salmon (*Salmo salar*) smolts down release ladders as spate (rain storm) > light intensity > water temperature. This hierarchy may be dynamic as critical thresholds for each of these factors may interact in eliciting migrational behavior of smolting salmonids.

The timing of smolt emigration past Woodbridge Dam during 1994 was similar to that observed in 1991 and 1992 but dissimilar to migration observed during 1990 and 1993 (Figure 19). In both 1990 and 1993, the peak emigration of smolts occurred during early June through mid June whereas in 1991, 1992 and 1994 the greatest majority of fish had migrated past Woodbridge Dam prior to June 1 (Figure 19). River flows during 1990, 1991, 1992 and 1994 were substantially lower during the principal migratory period than the river flow during the spring of 1993. Based on graphical presentations of the Bianchi *et. al.* (1992) data, it appears that water temperatures recorded in 1991 and 1992 at Woodbridge Dam were approximately 1 to 2 degrees Fahrenheit higher during comparable periods in 1993 which may account for some of the differences in migration timing between years. Water temperature data for 1990 were not available for direct comparison with 1993. The average daily water temperature recorded at Woodbridge Dam during April, May and June in 1993 was 56.3°F (S.D. 2.3) whereas the average daily water temperature at the same site and period in 1994 was 64.7°F (S.D. 3.1). This higher average daily water temperature in 1994 (approximately 8°F) may partially account for the earlier outmigration observed in 1994 than in 1993 (Figure 19).

The total numbers of young salmon estimated to have past Woodbridge Dam during April through July in 1993 and 1994 were substantially greater than during a similar time period in 1990, 1991, and 1992. Based on abundance index estimates in 1993 and 1994, 175,522 and

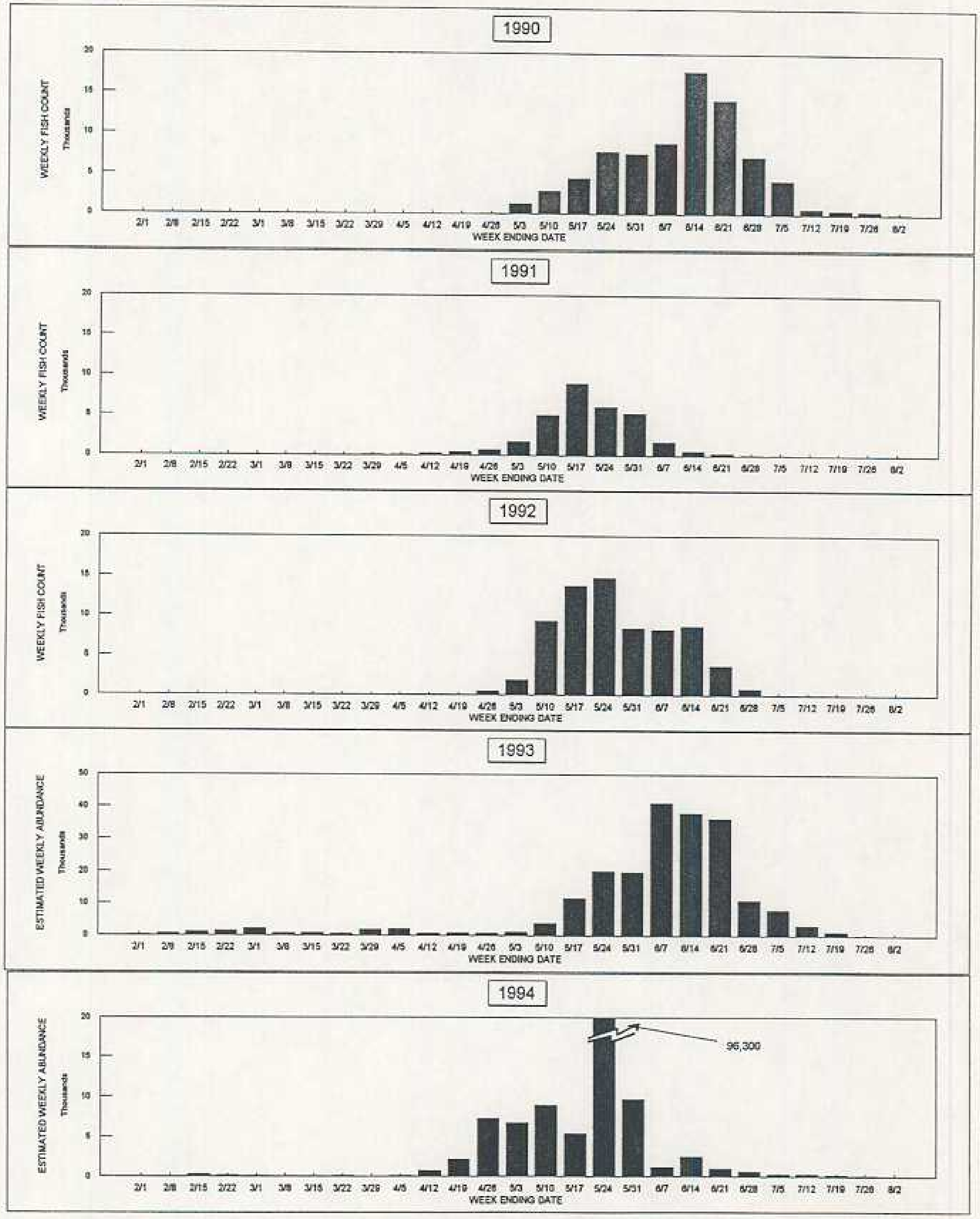

Figure 19. Comparison of weekly counts of downstream migrant chinook salmon at Woodbridge Dam for 1990, 1991 and 1993, and weekly abundance estimates of young chinook salmon at Woodbridge Dam for 1993 and 1994.

142,670 salmon, respectively, emigrated past Woodbridge Dam during April through July whereas only 78,179, 31,025, and 69,993 salmon were captured during a similar period in 1990, 1991, and 1992, respectively. Caution should be used in direct comparisons between years because of differences in sampling methods.

Assessment of Physical Injury of Juvenile Chinook Salmon Passing Woodbridge Dam

Eight tests on potential physical injury to young chinook salmon passing over Woodbridge Dam were performed during June 1 and 8, 1994. Of the 22 spill bays on Woodbridge Dam (Figure 2), tests were conducted in bay numbers 2 and 3. Results of these tests are given in Table 5. Our null hypothesis tested was that there would be no significant differences in the proportion of dead to live fish in comparable control and experimental groups of fish after four to seven days. We treated each comparison of mortality in control and experimental groups of fish independent from other tests (*i.e.*, data were not pooled).

After four days, no mortality was noted among any of the control or experimental groups of fish. After seven days, only one of the eight tests showed a higher mortality in the experimental group of fish as compared to the control group, whereas six of the tests showed a higher mortality among control fish. Based on these results, we could not detect any measurable mortality resulting from physical injury for fish passing over spill bays 2 and 3 on Woodbridge Dam. We suspect that the mortalities which did occur among control and experimental fish after being held for four to seven days were primarily attributable to relatively warm water temperatures (>65°F).

These test results were much different than similar tests performed at the dam in 1993. In 1993, 8 of 14 fish release tests demonstrated highly significant differences in the proportion of dead fish in experimental releases over the dam as compared to their corresponding control groups. Sixty percent of the mortalities observed in the 1993 experimental groups occurred within the first four days following test releases (Vogel and Marine 1994).

Factors potentially influencing young salmon passing over the top of Woodbridge Dam and through the riprap immediately downstream of the dam are varied and complex. Most of the 22 spill bays on the dam (*i.e.*, bay 4-22) are somewhat different in their physical and hydraulic configurations. The physical and hydraulic conditions fish are exposed to during their passage through or over the riprap downstream of each spill bay are different between bays. This latter circumstance is attributable to the non-uniform size, irregular shape, configuration, and distribution of the riprap material (mostly varying sizes of broken-up concrete) downstream of each spill bay. It would be very difficult to quantify those specific differences between spill bays because of the highly circuitous routes fish may pass over or through the riprap material. However, unlike bay numbers 4-22, water flowing over bays 1, 2 and 3 primarily passes onto smooth concrete downstream of the dam and into the dam's tailwater pool. This smoother route of passage for fish may account for the absence of physical-injury-related mortality noted in the 1994 tests. The 1993 tests where significant mortality occurred were performed in spill bays 9, 14 and 15, which pass flow into riprap downstream of the dam.

Table 5. Results of Physical Injury Tests Conducted on Juvenile Chinook Salmon at Woodbridge Dam During the Spring of 1994.

TEST GROUP	BAY#FROMLEFT SIDEFACINGDS	TESTDATE	APPROX. # OF FISHRELEASED	# OF FISH CAPTURED	CUMULATIVE MORTALITY (NUMBER OF FISH) FOLLOWING RECAPTURE							TOTAL #OFDEAD FISH	TOTAL#OF LIVEFISH	MEAN FL DEADFISH (mm)	MEANFL LIVEFISH (mm)	MORTALITY (%)	ADJ. DIFF. MORTALITY (%)
					1DAY	2DAYS	3DAYS	4DAYS	5DAYS	6DAYS	7DAYS						
1A-EXPERIMENTAL	3	6/01/94	500	28	0	0	0	0	0	0	1	1	27	65	77	3.6	
1B-CONTROL			100	72	0	0	0	0	1	1	3	5	67	68	77	6.9	(-3.3)
2A-EXPERIMENTAL	3	6/01/94	500	15	0	0	0	0	0	0	5	5	10	74	74	33.3	
2B-CONTROL			100	62	0	0	0	0	0	0	2	2	60	73	76	3.2	30.1
13A-EXPERIMENTAL	3	6/01/94	500	13	0	0	0	0	0	0	0	0	13	0	77	0.0	
13B-CONTROL			100	34	0	0	0	0	0	0	0	0	34	0	76	0.0	0.0
14A-EXPERIMENTAL	3	6/01/94	500	3	0	0	0	0	0	0	0	0	3	0	78	0.0	
14B-CONTROL			100	31	0	0	0	0	0	0	1	1	30	73	72	3.2	(-3.2)
1A-EXPERIMENTAL	2	6/08/94	500	37	0	0	0	0	0	1	1	2	35	68	84	5.4	
1B-CONTROL			60	95	0	0	0	0	0	3	5	8	87	72	87	8.4	(-3.0)
2A-EXPERIMENTAL	2	6/08/94	500	35	0	0	0	0	0	0	0	0	35	0	85	0.0	
2B-CONTROL			60	61	0	0	0	0	2	1	2	5	56	74	87	8.2	(-8.2)
13A-EXPERIMENTAL	2	6/08/94	500	47	0	0	0	0	0	0	0	0	47	0	83	0.0	
13B-CONTROL			60	44	0	0	0	0	1	1	3	5	39	71	86	11.4	(-11.4)
14A-EXPERIMENTAL	2	6/08/94	500	27	0	0	0	0	1	0	1	2	25	80	85	7.4	
14B-CONTROL			60	47	0	0	0	0	1	1	4	6	41	76	83	12.8	(-5.4)

Assessment of Survival of Juvenile Chinook Salmon Migrating Through the Sacramento-San Joaquin Delta During the Spring of 1994.

MRFI Chinook Salmon

Table 6 gives the release and recovery data for the approximately 207,000 hatchery fall-run chinook salmon coded-wire tagged at MRFI and released during the spring of 1994. Table 7 gives specific release data for each of the tag groups.

Table 6. Release and Recovery Information for Four Groups of Mokelumne River Fish Installation Coded-Wire Tagged Juvenile Fall-Run Chinook Salmon Captured at the Chipps Island USFWS Trawling Station, Spring 1994.

Tag Code	Release Date	Number of Fish Tagged	Date of First Catch	Date of Last Catch	Number of Fish Recovered	Days at Large	Minutes Sampled	Fraction of Time Sampled	Estimated Survival
6-48-03	5-10-94	53,606	5-15-94	5-26-94	5	12	2,360	0.13657	0.08879
6-48-04	5-10-94	49,864	5-15-94	5-31-94	6	17	3,160	0.12908	0.12119
6-48-01	5-23-94	51,314	5-27-94	5-31-94	9	5	1,000	0.13889	0.16417
6-48-02	5-23-94	51,418	5-27-94	6-6-94	10	11	2,200	0.13889	0.18204

The USFWS formula for calculating estimated fish survival based on recoveries of tagged fish in trawling samples collected by the USFWS near Chipps Island is as follows.

Estimated Survival = R / [(M) (30 feet / 3900 feet) (Proportion of Time Sampled)]

Table 7. Coded-Wire Tag Release Information for Mokelumne River Fall-Run Chinook Salmon, Spring 1994.

Code ID	Egg Lot No.	Brood Year	Release Location	Date Released		Rearing Type	Purpose	Total No. Tagged	Estimated Tag Loss & Mortality Prior to Release	No. Tagged Fish Released[1]	Quality Control Days	No./lb. at Release	Avg. Length in FL (mm)	Rearing Location	Stock of ReleaseGroup
				First	Last										
6-48-03 **	Mixed	1993	New Hope Landing-Mok. R.	5/10/94	5/10/94	Hatchery	Delta Mortality Estimate	54,102	0.9%	53,606	22-until chk 26-until rel.	59	87.2	Mokelumne River Fish Installation	Mokelumne River
6-48-04 **	Mixed	1993	New Hope Landing-Mok. R.	5/10/94	5/10/94	Hatchery	Delta Mortality Estimate	50,220	0.7%	49,864	18-until chk 22-until rel.	51	91.9	Mokelumne River Fish Installation	Mokelumne River
6-48-01 *	Mixed	1993	New Hope Landing-Mok. R.	5/23/94	5/23/94	Hatchery	Delta Mortality Estimate	51,741	0.8%	51,314	31-until chk 33-until rel.	44	95.5	Mokelumne River Fish Installation	Mokelumne River
6-48-02 *	Mixed	1993	New Hope Landing-Mok. R.	5/23/94	5/23/94	Hatchery	Delta Mortality Estimate	51,841	0.8%	51,418	26-until chk 28-until rel.	44	95.5	Mokelumne River Fish Installation	Mokelumne River
6-1-13-1-4	Wild	1993	Woodbridge Dam	4/8/94	6/20/94	Wild	Survival & Contrib.	7,354	3.2%	7,119	5-7[2]	56[3]	87	Mokelumne River Wild	Mokelumne River Wild
6-1-13-1-5	Wild	1993	Sacto. R. Rio Vista, CA	6/21/94	7/31/94	Wild	Survival & Contrib.	1,182	11.4%	1,047	0	31	102	Mokelumne River Wild	Mokelumne River Wild

* These groups were mixed prior to trucking and tag shed check . 6-48-01 and 6-48-02 treated as a single composite group with regard to tag shedding, mortality and size.
** Tag groups 6-48-03 and 6-48-04 were combined (as a result of mixing of tag groups 6-48-01 and 6-48-02) and treated as a single composite group when released.

1 Adjusted for estimated shed tags and pre-release mortality.
2 Quality control based on two holding periods. Only small sample sizes kept for these checks.
3 Average size for entire time interval over which tag code was used.

where R = number of tagged fish recovered and M = number of fish tagged (Mark Pierce, USFWS, Stockton, pers. comm.). A calculated value of 1 would represent 100 percent survival. For all tagged groups released, recoveries by the USFWS at their Chipps Island trawling station and their estimated survival rates were very low. Similarly low recovery rates on prior year's MRFI coded-wire tagged fall-run chinook were also evident (Bianchi *et al.* 1992, Vogel and Marine 1994). Delta hydrologic conditions were variable during the periods following when tagged fish were released (Appendix 7). Because the numbers of tagged fish recovered for all tagged groups were very small, we do not believe that specific conclusions can be derived from these data at this time. Tag recoveries in the ocean sport and commercial fisheries and in adult fish returning to the river systems during the next two to four years will provide better information concerning the tagged fish released during 1994.

Wild Chinook Salmon Smolts Coded-Wire Tagged at Woodbridge Dam

Appendix 2 provides a daily record of the numbers of wild fall chinook salmon smolts captured and coded-wire tagged at Woodbridge Dam. Additional relevant data are provided in Table 7. Tagging was initiated on April 8, 1994 when a substantial increase in the numbers of smolt-sized salmon was observed in the traps. Two tag codes were used during the season. These two codes were allocated to essentially the first and second halves of the total migration of smolts as follows:

Dates of Application	Tag Code	Nos. Tagged*	Avg. Size of Fish	Release Site
4/8/94 to 6/20/94	6-1-13-1-4	7119	87 mm TL	Mokelumne River (Woodbridge Dam)
6/21/94 to 7/31/94	6-1-13-1-5	1047	102 mm TL	Sacramento River (Rio Vista, CA)

*includes 96.8% tag retention adjustment

No latent mortality was observed in two samples of the first tag code group of fish retained for tagging quality control. Two samples of 32 and 16 fish were held for 5 to 7 days, respectively, during the first tag code period. One hundred percent tag retention and 94% retention, respectively, were observed for these samples of this tag code group. No tag retention determinations could be made for the second tag code group since water temperatures were elevated at Woodbridge Dam during the period of application and fish could not be safely confined and held at those temperatures. Tagging reports with all the preceding information were submitted to CDFG during July and August 1994.

None of these tagged wild chinook salmon were reported as captured by the USFWS at their trawling station near Chipps Island. Because the numbers released were relatively small, no inferences can be made as to survival rates for these fish migrating through the Delta. As discussed for the MRFI hatchery coded-wire salmon, tag recoveries in the ocean sport and commercial fisheries and in adult fish returning to the river systems are expected to provide better information concerning these two groups of fish.

Releases of PIT-Tagged Chinook Salmon in Lake Lodi

Figure 5 shows the locations where PIT-tagged chinook salmon were released in Lake Lodi on July 18-20, 1994. Table 8 and Appendix 8 give the results of those releases. Of 1,249 PIT-tagged salmon released, only 135 fish (10.8%) were recaptured in the two downstream migrant fish traps at Woodbridge Dam. The recapture rates for all release groups was consistently low for all seven releases, ranging from 6.9% to 14.5%. Because nearly the entire flow past Woodbridge Dam during this time of year was comprised of flow entering the high-stage fishway (via a culvert) or the low-stage fishway (the WID fish screen bypass outfall) (Figure 2), it was assumed the fish traps were 100 percent efficient in capturing fish choosing these passage routes. The fate of the fish not captured (89.2%) is unknown. Those fish could have migrated past the dam after August 1 when the traps were removed, remained in Lake Lodi, migrated to upstream locations, or die from unknown factors (*e.g.*, predation).

Although mortality estimates for PIT-tagged fish are not possible for the previously described reasons, several interesting observations on fish behavior can be made. The median elapsed time between release and recapture for all fish was approximately 1.5 days. Eight fish were not recaptured until more than ten days after their release had elapsed (Appendix 8). There was a greater tendency for fish to use the WID fish screen bypass (101 fish or 75%) than the roadway culvert (34 fish or 25%) as a route of passage at the dam. We suspect that this behavior was largely attributable to the disproportionate flow split toward the fish screens (*i.e.*, greater) than toward the dam. Fish utilizing the fish screen bypass exhibited a lower median recovery time than fish migrating through the roadway culvert (1.47 days versus 4.49 days, respectively). Fish in the immediate vicinity of the dam may have had difficulty locating the small submerged culvert opening under the roadway (Figure 2). It is interesting to note that the greatest proportion of fish released near Woodbridge Dam swam back upstream and through the fish screen bypass instead of through the culvert into the high-stage fishway (Table 8 and Figure 5). The one group of fish released just upstream of the WID fish screens showed the most rapid rate of migration (0.46 days recovery time). Excluding Release No. 7 in which only 2 fish were recovered, the furthest upstream release group showed the slowest median migration rate (3.84 days).

Table 8. Recovery Data for PIT-Tagged Chinook Salmon Released at Various Locations in Lake Lodi and Recovered in Two Fish Traps at Woodbridge Dam (refer to Figure 5 for release locations).

Release Location*:	Total Number Released:	Recovery Location:				Total Recovered	Total Median Recovery Time (days)	Percent Recaptured
		High-Stage Fishway		Low-Stage Fishway				
		Number	Median Recovery Time (days)	Number	Median Recovery Time (days)			
1 (RM 38.7)	200	3	10.48	18	1.55	21	1.55	10.5%
2 (RM 39.0)	200	3	4.48	18	0.46	21	0.46	10.5%
3 (RM 39.7)	200	6	4.98	23	1.46	29	1.46	14.5%
4 (RM 40.75)	200	8	4.61	16	1.47	24	1.47	12.0%
5 (RM 42.1)	204	10	3.85	8	1.82	18	3.84	8.8%
6 (RM 39.7)	216	4	3.97	16	0.83	20	0.83	9.3%
7 (RM 38.6)	29	0	N/A	2	6.47	2	6.47	6.9%
Totals	1249	34	4.49	101	1.46	135	1.47	10.8%

*** Release Locations:**

1=250 ft u/s of WID Dam @ 2115 hrs, 7/18/94
2=50 ft u/s of WID screens @ 2105 hrs, 7/18/94
3=Park Gazebo @ 2115 hrs, 7/19/94
4=Concrete Pad @ 2100 hrs, 7/19/94
5=Railroad Bridge @ 1230 hrs, 7/20/94
6=Park Gazebo @ 1215 hrs, 7/20/94
7=WID Dam @ 1230 hrs, 7/20/94

Radio-Telemetry Assessment of the Migratory Behavior of Juvenile Salmonids Through Lake Lodi

Eighteen age 1+ hatchery-reared steelhead and one age 1+ fall chinook salmon that was captured in the rotary screw trap at Woodbridge Dam were radio tagged and released in Lake Lodi at two different locations. The results of this telemetry effort are summarized in Table 9.

Table 9. Summary of Results for Releases of Radio-Tagged Juvenile Salmonids in Lake Lodi During the Period of April - July 1994.

Date of Release	Location of Release	Species	N	# Approaching Dam	# Passing Dam	Delay in Passing Dam (days after first encounter)
4/22/94	Hwy 99 Br. (RM 43)	STH	4	2	1	5days
5/27/94	Hwy 99 Br. (RM 43)	STH	5	1	0	N/A
6/11/94 [1]	Hwy 99 Br. (RM 43)	STH	4	0	0	N/A
6/16/94 [2]	Hwy 99 Br. (RM 43)	FCS (Age 1+)	1	0	0	N/A
7/7/94 [3]	40 m u/s from WID intake	STH	5	2	1	20 days

[1]Three of four steelhead released moved upstream of the release site and remained upstream until transmitters failed.

[2]This salmon moved 3 river miles downstream to RM41 and remained in this vicinity, actively moving in response to boat traffic, for 6 days prior to failure of transmitter.

[3]All five steelhead released for these observations remained in the vicinity of Lake Lodi Park or near WID intake or near dam. One radio-tagged steelhead was recaptured in the fish bypass outfall downstream migrant trap on 7/27/94, 20 days after release.

Juvenile steelhead exhibited both upstream and downstream movements in Lake Lodi upon release during the period of observations from April through July 1994. Movements of five of the radio-tagged fish were tracked to Woodbridge Dam. A fairly slow rate of downstream movement under conditions during the period of study was observed for radio-tagged juvenile steelhead. The five fish that approached and encountered the dam did so over a period of time ranging from about 1.5 to 10 days. Three of these fish were released near the head of Lake Lodi approximately 5 river miles upstream from Woodbridge Dam near the state highway bridge crossing (Highway 99) and migrated to the dam at rates ranging from about 0.5 to 2.0 miles per day.

Of the five radio-tagged steelhead approaching Woodbridge Dam, only two were detected (either by telemetry or recapture in downstream migrant traps) to have passed the dam, and apparent delays in passing the dam for these two fish ranged from 5 to 20 days. Transmitter life for the small radio tags ranged from 8 to 13 days and limited the time of observation; so the eventual fates for fish that remained in the vicinity of the dam at the time of transmitter failure and were not captured in the downstream migrant traps are not known.

The behavior of juvenile steelhead during the period of investigation probably was not representative of that of actively emigrating steelhead smolts. Most steelhead smolts (age 1 to age 2+ steelhead) in Central Valley streams begin migrating downstream during the first storm runoff events in the fall and continue to emigrate through the winter and early spring months (Hallock 1989). Use of steelhead smolts during the normal downstream migration period would likely produce very different results. The use of actively migrating salmonid smolts was originally planned for this task to produce more meaningful results. However, young-of-year fall chinook salmon were too small to outfit with radio tags even at the larger fish sizes occurring late in the season. We attempted to radio tag 10 young-of-year fall chinook salmon captured at Woodbridge Dam; but after recovery from the tagging surgery, all 10 fish died during a subsequent 24-hour post-tagging observation period. The single yearling fall chinook salmon captured and radio-tagged at Woodbridge Dam survived the required handling and tagging surgery, but its transmitter failed 6 days after its release.

Based on the experience gained during this season, it is recommended that yearling-sized fall chinook salmon be used in future radio telemetry evaluations of juvenile salmonid migratory behavior in Lake Lodi. Yearling salmon may be used as late as March and April for behavioral assessments of downstream migration with reasonable results (Vogel *et al.* 1988).

Lake Lodi Water Quality Monitoring

Appendix 9 gives the data for all water quality monitoring from May 26 through July 25, 1994 in Lake Lodi and the Mokelumne River. Figure 20 shows that a substantial increase in water temperature occurred from upstream to downstream areas during this entire period. In addition, thermal stratification in Lake Lodi was evident during all monitoring. Water was generally cooler at River Mile 39.0 in the right channel (facing downstream) as compared to the left channel near the WID screens (Figure 5), presumably because of the deeper water in the right channel (Appendix 9). PH, a measure of the hydrogen ion concentration of the water, ranged between 8.15 to 9.52. On some occasions, the deepest stations (approximately 15 feet) sampled in Lake Lodi exhibited a tendency of the highest pH values near the surface. These results may be attributable to higher algal and photosynthesis activity near the surface than near the bottom of the reservoir. All measured pH values were relatively high and approached the maximum recommended pH criteria for most fishes which is about 9.0 (EIFAC 1969, Piper *et. al.* 1982, Spotte 1970). Depending on site-specific conditions, these levels could be stressful to rearing salmonids. Dissolved oxygen (DO) levels during the season varied from 8.45 mg/l to 11.34 mg/l and 92.8% saturation to 124.5% saturation (Appendix 9). These values are within satisfactory ranges of fish. Specific conductance, which is an indirect measurement of total dissolved solids, ranged from 39.6 to 47.7 μs/cm. These values varied very little over the season and between locations (Appendix 9.)

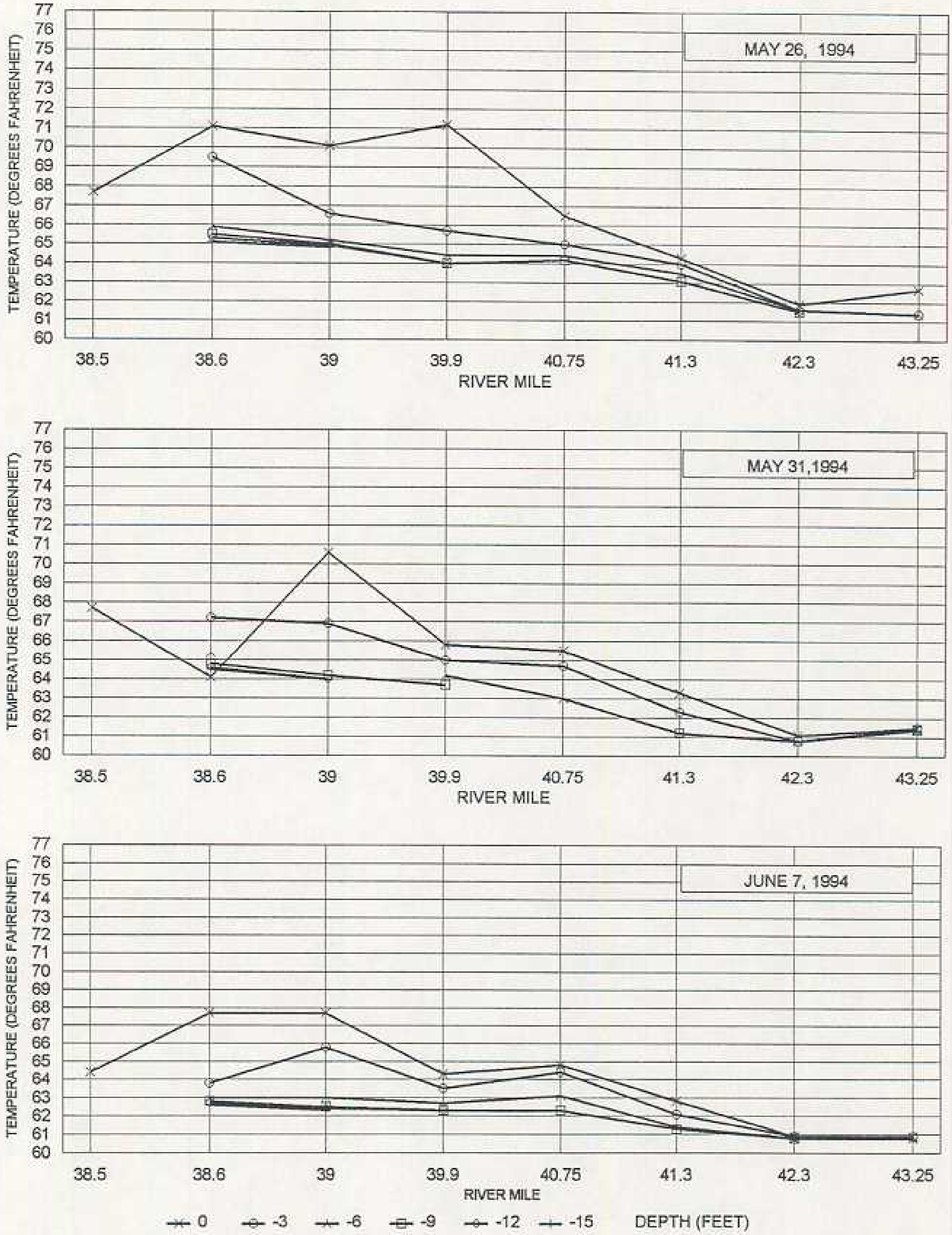

Figure 20. Water temperature measurements (in Fahrenheit) for Lake Lodi and the Mokelumne River (May 26 to July 25, 1994).

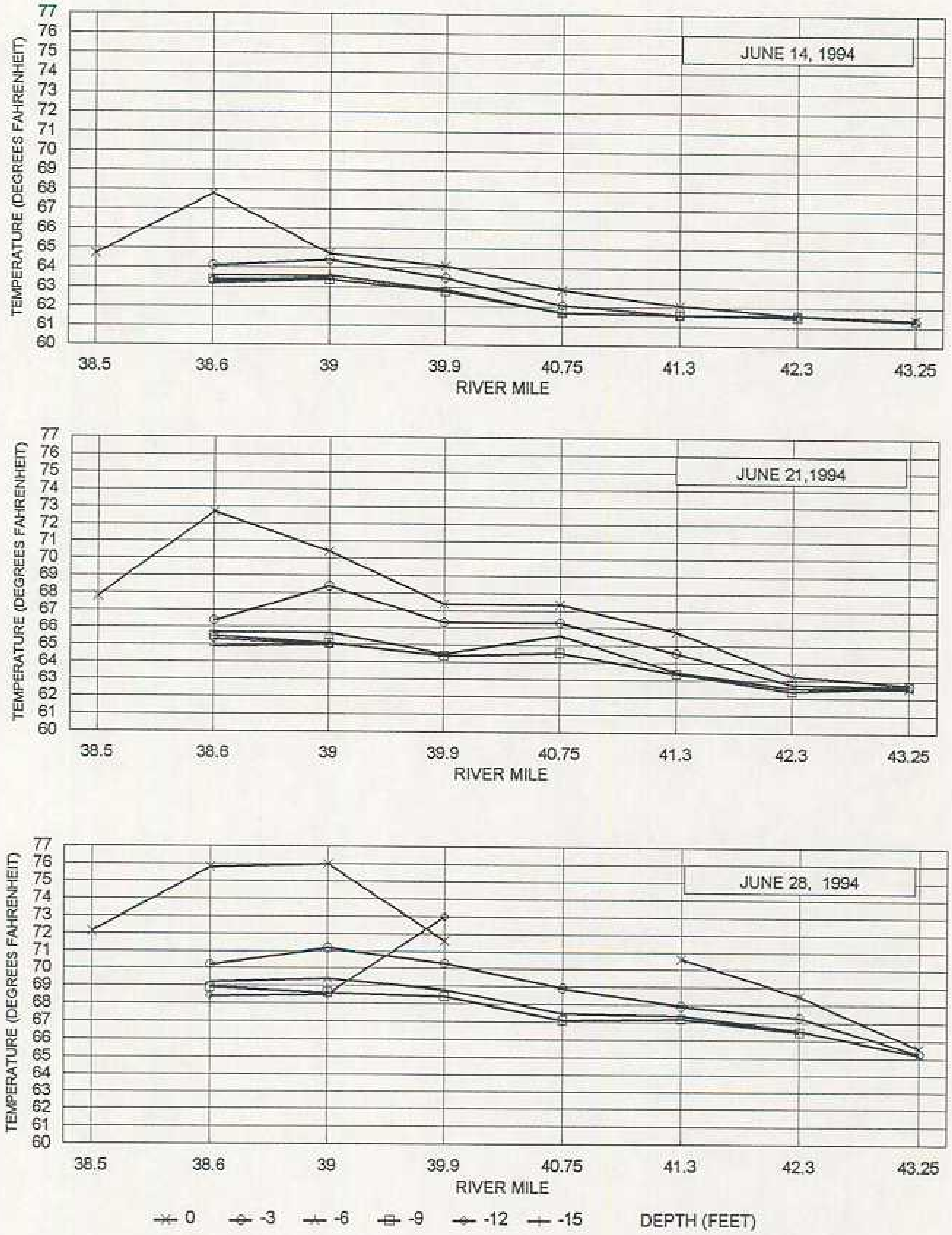

Figure 20 (continued). Water temperature measurements (in Fahrenheit) for Lake Lodi and the Mokelumne River (May 26 to July 25, 1994).

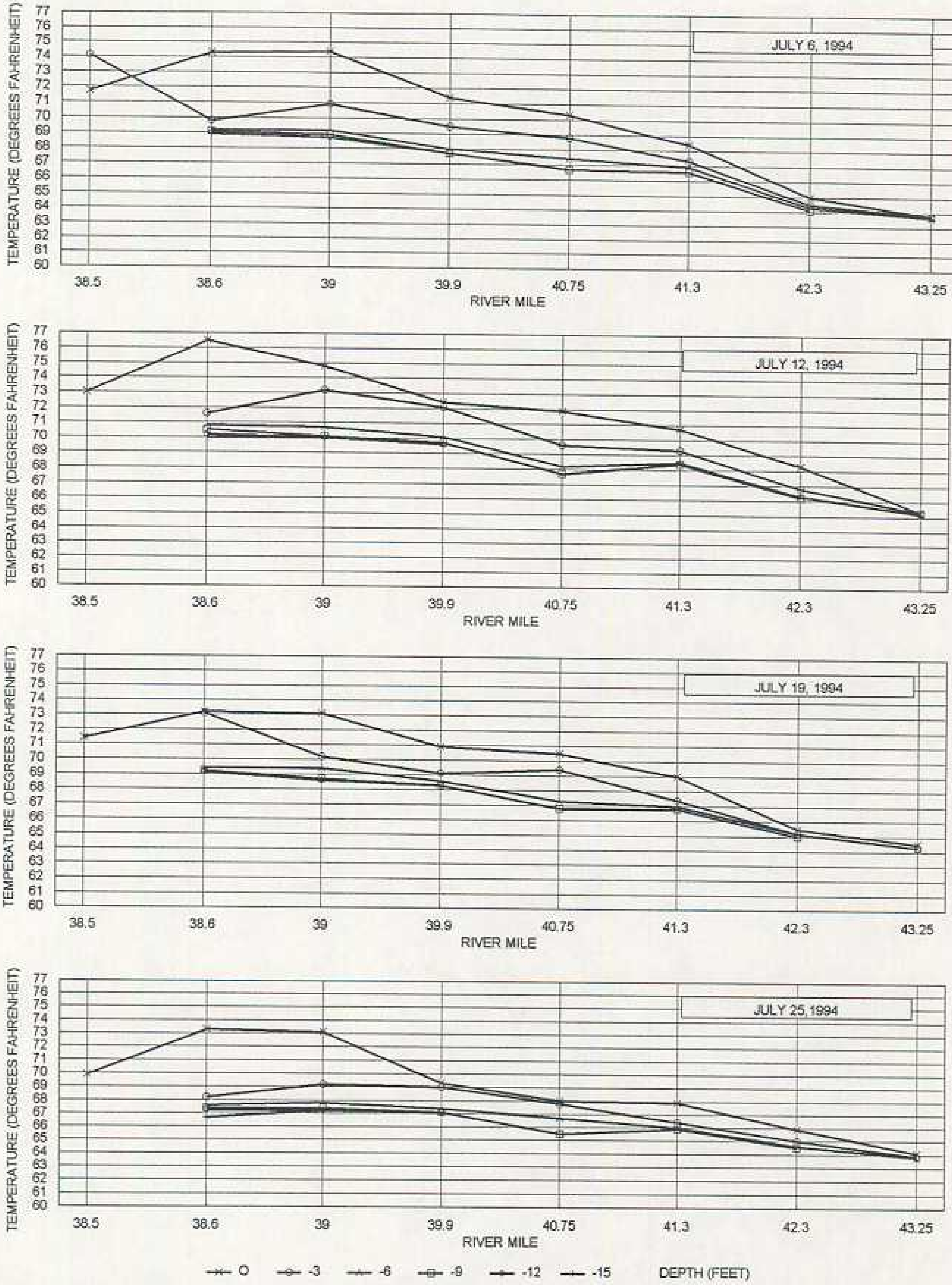

Figure 20 (continued). Water temperature measurements (in Fahrenheit) for Lake Lodi and the Mokelumne River (May 26 to July 25, 1994).

Physiological Assessment of Smolt Development of Fall Chinook Salmon

The temporal development of gill Na^+/K^+ ATPase activity has been used successfully to characterize one of the many physiological metamorphoses that salmon undergo preparatory to their transition from an early life stage in freshwater to their ocean life stage (Hoar 1988). The underlying physiological processes reflected by changes in gill Na^+/K^+ ATPase have also been demonstrated to be affected by environmental factors such as photoperiod, water chemistry, and water temperature, as well as, biological factors such as disease, social interactions, and nutrition (Ewing *et al.* 1979, Lorz and McPherson 1977, Schreck *et al.* 1985, Wedemeyer *et al.* 1980, Zaugg 1982).

Smolt development was monitored in samples of downstream migrant salmon captured in the downstream migrant traps at Woodbridge Dam and in comparative samples collected on the rearing grounds in the river reaches upstream from Woodbridge Dam. Data collected from all fish sampled for physiological measurements are provided in Appendix 10 and Table 10 provides a summary of these results.

Table 10. Comparison of size, condition factor, gill Na^+/K^+ ATPase specific activity in samples of young-of-year chinook salmon collected in downstream migrant traps at Woodbridge Dam and by beach seining in the rearing reaches of the Mokelumne River during March through July 1994 (values are means with standard deviations in parentheses).

	Upstream Habitat					Woodbridge Dam				
Date	TL(mm)	Wt (g)	K	Na^+/K^+ ATPase (um P/mgProt./hr)	N	TL(mm)	Wt(g)	K	Na^+/K^+ ATPase (um P/mgProt./hr)	N
3/25/94	56 (6.1)	1.5 (.44)	.000807 (.00004)	2.9 (1.97)	10					0
4/11/94					0	90 (7.8)	5.7 (1.64)	.000758 (.00003)	3.95 (0.77)	7
4/12/94	68 (12.2)	1.8 (0.90)	.000540 (.00008)	1.8 (0.80)	8					0
4/25/94	79 (5.7)	4.2 (0.77)	.000847 (.00004)	3.33 (0.86)	7	104 (8.5)	9.0 (2.18)	.000780 (.00006)	4.14 (0.78)	6
5/10/94	83 (2.3)	4.9 (0.66)	.000868 (.00008)	3.15 (0.54)	6	84 (5.9)	6.5 (1.65)	.00106 (.00007)	5.74 (1.4)	6
5/23/94	85 (4.6)	5.6 (0.48)	.000907 (.00008)	2.38 (0.92)	6	101 (4.6)	8.2 (1.1)	.000788 (.00005)	2.33 (1.57)	6
6/10/94					0	103 (6.1)	8.6 (1.18)	.000797 (.00006)	2.35 (1.03)	7
6/24/94	95	7.9	.000921	0.48	1	109 (5.1)	11.4 (1.67)	.000874 (.00004)	2.49 (1.02)	7
7/10/94					0	111 (12)	10.5 (2.22)	.000764 (.0001)	2.52 (1.38)	7
7/23/94					0	109 (7.8)	10.3 (2.49)	.000794 (.00009)	2.21 (1.63)	7

Size of fish sampled at both locations generally increased throughout the season. Fish migrating by Woodbridge Dam were generally significantly larger (α=0.05) than fish collected on the rearing grounds, except on May 10. Condition factor of fish on the rearing grounds was generally greater than that of fish migrating past Woodbridge Dam. This difference in condition factor between fish on the rearing grounds and those passing Woodbridge Dam was also observed during 1993 by Vogel and Marine (1994) and is attributed to morphological changes (fish become less plump), which affect condition factor, that occur during smoltification for several species of salmonids (Hoar 1988, McKeown 1984, Woo *et al.* 1978).

Gill Na^+/K^+ ATPase activity also reflected potential differences in the smolt status of juvenile salmon as they rear in the lower Mokelumne River. Specific activity of gill Na^+/K^+ ATPase was higher throughout the season in fish migrating past Woodbridge Dam than in fish collected from the rearing grounds (Figure 18). This difference was statistically significant ($P<0.05$) on April 11 and again on May 10. Peaks of gill Na^+/K^+ ATPase activity for fish collected in the rearing habitats occurred simultaneous with the full moon in March and April, however, no cyclic changes in gill Na^+/K^+ ATPase activity were observed for fish passing Woodbridge Dam. Lack of distinct cyclic changes in gill Na^+/K^+ ATPase activity in wild coho salmon compared to that observed for hatchery-reared salmon was also noted by Rodgers *et al.* (1987); so, periodicity of this smolt indice should not necessarily be expected in samples from wild fish.

Gill Na^+/K^+ ATPase activity decreased in samples of fish from both locations after mid-May. Gill Na^+/K^+ ATPase activity remained relatively constant at lower levels for samples collected from fish passing Woodbridge Dam during June and July. Few fish remained on the rearing grounds during June and July and only one fish was collected there during those months despite persistent efforts to collect them. The specific nature of this decline in gill Na^+/K^+ ATPase activity late in the season is not specifically revealed by the data set. It may be a characteristic of the population of late-migrating smolts, perhaps reflective of a slower smolt development in these fishes. Alternatively, it may occur in response to a threshold elevated water temperature. Decreased gill Na^+/K^+ ATPase activity related to elevated water temperatures has been observed for laboratory populations of chinook salmon (Ewing *et al.* 1979, Wedemeyer *et al.* 1980, Zaugg 1982). However, this response in wild fish has not yet been confirmed.

Gill Na^+/K^+ ATPase activities, along with other indices of smolt development such as condition factor, of young-of-year fall chinook salmon passing Woodbridge Dam indicate that these fish are undergoing active smoltification preparatory to their transition to life in seawater. The use of gill Na^+/K^+ ATPase activity as an assessment tool for monitoring the effects of changes in environmental factors, particularly water temperature, on smolt development may be useful for evaluating different management options for the lower Mokelumne River. This year's experience indicates that it can detect spatiotemporal differences in gill Na^+/K^+ ATPase activity of actively migrating and rearing salmon. Additional assessment of this technique under differing hydrologic year types with different water temperature regimes would allow resolution of the competing hypotheses potentially explaining observations during 1994.

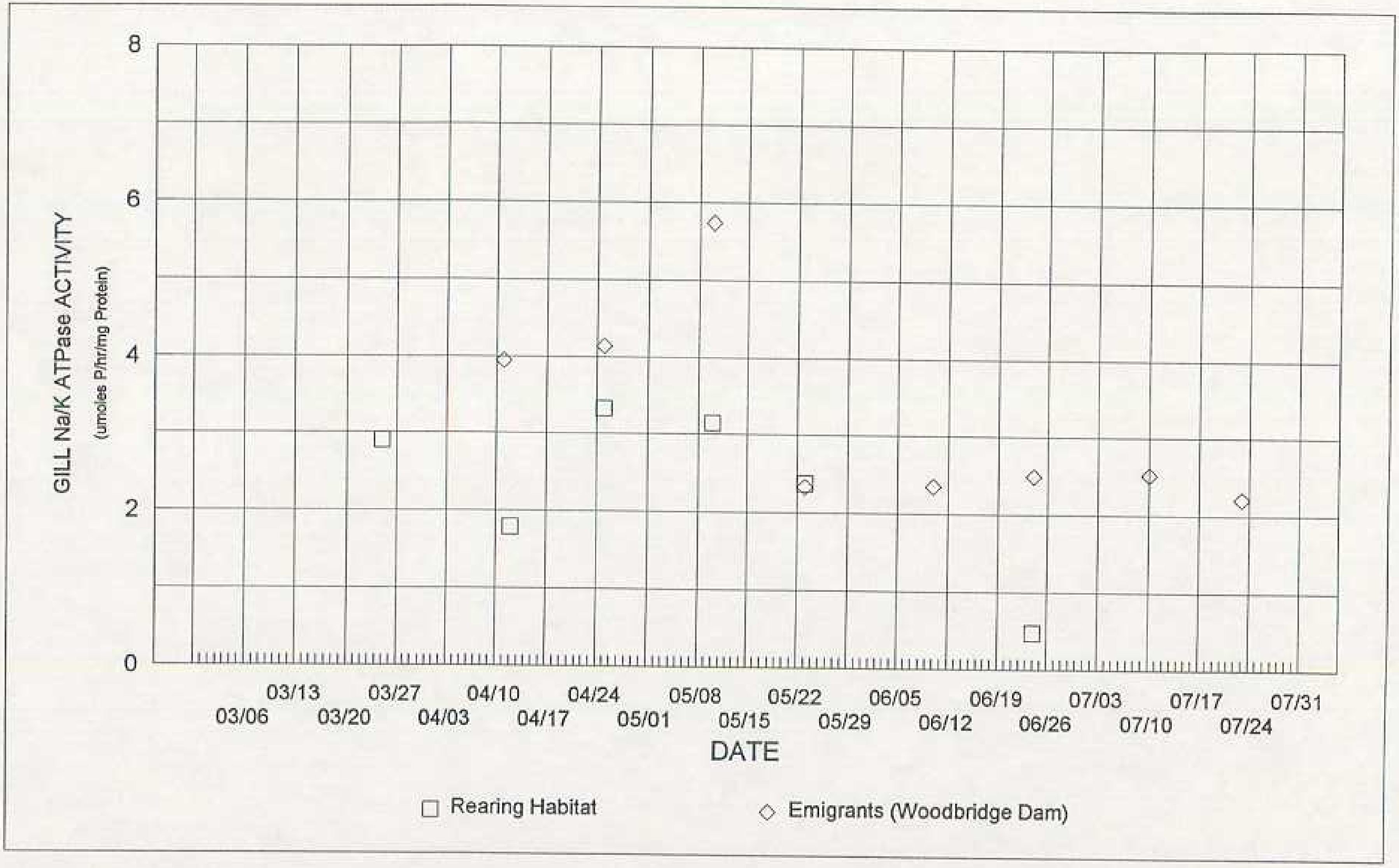

Figure 21. Temporal profile of mean gill Na+/K+ ATPase specific activity from samples of young-of-year fall chinook salmon collected in the rearing reaches and as emigrants passing Woodbridge Dam on the Mokelumne River during March through July 1994 (values are means of N=6 - 10 measurements, except for 6/24/94 rearing habitat sample in which N=1).

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APPENDICES

Appendix 1. 1993-94 Downstream Migrant Database - October 1993 - July 1994

Age 1 Fall Chinook Salmon

Woodbridge Dam

	AGE 1+ NOCTURNAL TOTALS				AGE 1+ DIURNAL TOTALS				AGE 1+ DAILY TOTALS				DOWNSTREAM MIGRANT TRAP OPERATIONS DATA					
																Time Fished		
Date	Number Captured	Number Ad Clips	Number Injuries	Number Mortality	Number Captured	Number Ad Clips	Number Injuries	Number Mortality	GrandTotal Captured	randTotal Ad Clips	randTotal Injuries	GrandTotal Mortality	# of Screw Traps	L.S. Fishway Trap (Y/N)	H.S. Fishway Trap (Y/N)	Nocturnal	Diurnal	Total
10/15									0	0		0	0	N	N			0.00
10/16									0	0		0	0	N	N			0.00
10/17									0	0		0	0	N	N			0.00
10/18									0	0		0	0	N	N			0.00
10/19									0	0		0	0	N	N			0.00
10/20									0	0		0	0	N	N			0.00
10/21	12	0		0	19	2		4	31	2		4	2	N	N	n	8.00	r
10/22	55	13		0	21	9		0	76	22		0	2	N	N	16.00	8.00	24.00
10/23	27	12		0	9	2		0	36	14		0	2	N	N	16.00	7.50	23.50
10/24	38	13		0	16	4		0	54	17		0	2	N	N	16.50	7.00	23.50
10/25	91	24		0	12	6		0	103	30		0	2	N	N	17.00	7.00	24.00
10/26	1	1		0	0	0		0	1	1		0	2	N	N	17.00	r	r
10/27	27	16		0	36	13		0	63	29		0	1	N	N	n	8.00	r
10/28	39	7		0	6	1		0	45	8		0	1	N	N	16.00	8.00	24.00
10/29	43	15		3	10	2		1	53	17		4	2	N	N	16.00	7.50	23.50
10/30	43	12		0	12	2		0	55	14		0	2	N	N	16.00	7.50	23.50
10/31	7	1		0	16	7		0	23	8		0	2	N	N	16.00	r	r
11/01	78	11		0	Dam Boards Pulled - No Trapping During This Procedure				78	11		0	2	N	N	n		r
11/02	Dam Boards Pulled - No Trapping During This Procedure				Dam Boards Pulled - No Trapping During This Procedure				0	0		0	0	N	N			0.00
11/03	Resumed Trapping at 0800h for Diurnal Count				121	41		19	121	41		19	2	N	N		8.50	8.50
11/04	155	34		35	31	10		3	186	44		38	2	N	N	17.00	6.50	23.50
11/05	99	17		4	14	3		1	113	20		5	2	N	N	16.50	7.50	24.00
11/06	118	29		0	11	3		0	129	32		0	2	N	N	16.50	7.50	24.00
11/07	78	16		1	12	5		0	88	21		1	2	N	N	16.50	7.00	23.50
11/08	80	12		0	8	1		0	88	13		0	2	N	N	17.00	7.50	24.50
11/09	71	11		0	19	6		0	90	17		0	2	N	N	15.50	8.50	24.00
11/10	56	14		1	24	4		0	80	18		1	2	N	N	16.50	7.00	23.50
11/11	692	173		341	1	0		0	693	173		341	2	N	N	17.50	6.50	24.00
11/12	247	49		12	8	4		0	255	53		12	2	N	N	17.00	7.00	24.00
11/13	110	29		8	8	2		0	118	31		8	2	N	N	17.00	7.00	24.00
11/14	77	19		2	4	1		0	81	20		2	2	N	N	17.50	6.50	24.00
11/15	36	9		2	0	0		0	36	9		2	2	N	N	17.00	7.00	24.00
11/16	58	15		1	10	2		0	68	17		1	2	N	N	17.00	7.00	24.00
11/17	50	12		3	0	0		0	50	12		3	2	N	N	17.00	6.50	23.50
11/18	72	9		2	3	0		0	75	9		2	2	N	N	18.00	6.50	24.50
11/19	37	5		1	4	2		0	41	7		1	2	N	N	17.50	6.00	23.50
11/20	48	12		1	4	2		0	52	14		1	2	N	N	18.00	7.00	25.00
11/21	30	2		0	5	0		0	35	2		0	2	N	N	16.50	7.00	23.50
11/22	36	13		0	7	1		0	43	14		0	2	N	N	17.00	7.50	24.50
11/23	54	13		0	8	1		0	62	14		0	2	N	N	17.00	6.50	23.50
11/24	27	10		1	9	4		0	36	14		1	2	N	N	17.50	6.50	24.00
11/25	26	6		0					26	6		0	2	N	N	16.50	d	16.50
11/26	53	14		2	12	3		0	65	17		2	2	N	N	24.50	7.00	31.50
11/27	63	25		0	7	2		0	70	27		0	2	N	N	17.00	6.00	23.00
11/28	37	6		1	23	9		0	60	15		1	2	N	N	18.00	6.50	24.50
11/29	215	59		19	31	3		0	246	62		19	2	N	N	18.00	6.00	24.00
11/30	823	65		457	73	12		3	896	77		460	2	N	N	17.50	6.00	23.50
12/01	223	77		14	26	6		0	249	83		14	2	N	N	18.00	6.00	24.00
12/02	35	4		4	3	1		0	38	5		4	2	N	N	18.00	5.50	23.50
12/03	27	7		4	9	2		0	36	9		4	2	N	N	18.50	6.00	24.50
12/04	42	10		3	4	1		0	46	11		3	2	N	N	18.00	6.00	24.00
12/05	24	6		0	1	0		0	25	6		0	2	N	N	18.00	6.00	24.00
12/06	12	1		1	4	0		0	16	1		1	2	N	N	18.00	6.50	24.50
12/07	10	1		1	0	0		0	10	1		1	2	N	N	17.00	6.50	23.50
12/08	24	8		2	15	3		0	39	11		2	2	N	N	17.50	6.00	23.50
12/09	32	9		2	22	9		0	54	18		2	2	N	N	18.00	6.00	24.00
12/10	36	16		0	0	0		0	36	16		0	2	N	N	18.00	6.00	24.00
12/11	20	11		0	6	0		0	26	11		0	2	N	N	18.00	6.00	24.00
12/12	56	5		0	3	0		0	59	5		0	2	N	N	17.50	6.50	24.00
12/13	8	2		0	0	0		0	8	2		0	2	N	N	17.50	6.50	24.00
12/14	12	1		0	2	0		0	14	1		0	2	N	N	17.50	6.50	24.00
12/15	65	17		1	6	1		0	71	18		1	2	N	N	17.50	6.50	24.00
12/16	37	4		0	6	1		0	43	6		0	2	N	N	17.50	6.50	24.00

Appendix 1. 1993-94 Downstream Migrant Database - October 1993 - July 1994 — Age 1 Fall Chinook Salmon — Woodbridge Dam

Date	AGE 1+ NOCTURNAL TOTALS Number Captured	Number Ad Clips	Number Injuries	Number Mortality	AGE 1+ DIURNAL TOTALS Number Captured	Number Ad Clips	Number Injuries	Number Mortality	AGE 1+ DAILY TOTALS GrandTotal Captured	GrandTotal Ad Clips	GrandTotal Injuries	GrandTotal Mortality	DOWNSTREAM MIGRANT TRAP OPERATIONS DATA # of Screw Traps	L.S. Fishway Trap (Y/N)	H.S. Fishway Trap (Y/N)	Time Fished Nocturnal	Time Fished Diurnal	Time Fished Total
12/17	17	3		0	9	2		0	26	5		0	2	N	N	17.00	7.00	24.00
12/18	14	4		0	4	0		0	18	4		0	2	N	N	17.50	6.00	23.50
12/19	6	1		0	2	0		0	8	1		0	2	N	N	17.50	6.50	24.00
12/20	9	0		0	6	2		0	15	2		0	2	N	N	17.50	6.50	24.00
12/21	16	4		0	0	0		0	16	4		0	2	N	N	17.50	6.50	24.00
12/22	12	1		0	3	0		0	15	1		0	2	N	N	17.50	6.50	24.00
12/23	18	1		1	3	3		0	21	4		1	2	N	N	17.50	6.50	24.00
12/24	17	5		0	2	0		0	19	5		0	2	N	N	17.50	7.00	24.50
12/25	14	4		0					14	4		0	2	N	N	17.00	a	17.00
12/26	11	2		0	0	0		0	11	2		0	2	N	N	23.50	6.00	29.50
12/27	23	5		0	7	1		0	30	6		0	2	N	N	17.50	6.50	24.00
12/28	19	4		0	6	0		0	25	4		0	2	N	N	17.50	6.50	24.00
12/29	34	7		0	6	1		0	40	8		0	2	N	N	17.50	6.50	24.00
12/30	13	3		0	4	0		0	17	3		0	2	N	N	17.50	6.50	24.00
12/31	22	9		1	8	2		0	30	11		1	2	N	N	17.50	6.50	24.00
01/01	3	1		0					3	1		0	2	N	N	17.00	a	17.00
01/02	13	4		0	3	0		0	16	4		0	2	N	N	24.00	7.00	31.00
01/03	12	4		0	6	0		0	18	4		0	2	N	N	17.00	7.00	24.00
01/04	11	1		0	4	0		0	15	1		0	2	N	N	17.00	7.00	24.00
01/05	63	9		0	6	0		0	69	9		0	2	N	N	17.00	7.00	24.00
01/06	13	4		0	7	2		0	20	6		0	2	N	N	17.00	7.00	24.00
01/07	10	3		0	6	1		1	16	4		1	2	N	N	17.00	7.00	24.00
01/08	12	3		1	5	1		0	17	4		1	2	N	N	17.00	7.00	24.00
01/09	21	4		0	6	0		0	27	4		0	2	N	N	17.00	7.00	24.00
01/10	12	1		0	5	1		0	17	2		0	2	N	N	17.00	7.00	24.00
01/11	18	5		0	8	1		0	26	6		0	2	N	N	17.00	7.00	24.00
01/12	15	3		0	27	7		0	42	10		0	2	N	N	17.00	6.50	23.50
01/13	24	5		0	8	1		0	32	6		0	2	N	N	16.75	6.50	23.25
01/14	17	3		0	11	2		0	28	5		0	2	N	N	16.50	6.50	23.00
01/15	23	5		0	7	1		0	30	6		0	2	N	N	16.50	6.75	23.25
01/16	12	4		0	6	1		0	18	5		0	2	N	N	16.00	7.50	23.50
01/17	10	3		0	3	0		0	13	3		0	2	N	N	15.75	6.75	22.50
01/18	4	2		0	11	5		0	15	7		0	2	N	N	16.25	6.75	23.00
01/19	28	8		1	5	1		0	33	9		1	2	N	N	16.25	7.00	23.25
01/20	16	3		0	5	1		0	21	4		0	2	N	N	16.75	6.75	23.50
01/21	13	5		0	5	0		0	18	5		0	2	N	N	16.25	6.75	23.00
01/22	14	6		0	6	2		0	20	8		0	2	N	N	16.25	6.75	23.00
01/23	10	3		0	30	6		0	40	9		0	2	N	N	16.25	7.25	23.50
01/24	50	15		1	0	0		0	50	15		1	2	N	N	16.25	6.50	22.75
01/25	62	21		0	56	18		3	118	39		3	2	N	N	16.50	7.25	23.75
01/26	126	42		0	9	3		0	135	45		0	2	N	N	15.75	7.50	23.25
01/27	13	4		0	5	1		0	18	5		0	2	N	N	15.75	7.00	22.75
01/28	21	7		0	0	0		0	21	7		0	2	N	N	16.00	7.50	23.50
01/29	12	4		0	0	0		0	12	4		0	2	N	N	15.50	6.50	22.00
01/30	11	4		0	4	1		0	15	5		0	2	N	N	16.25	6.50	22.75
01/31	3	1		0	0	0		0	3	1		0	2	N	N	16.25	6.50	22.75
02/01	20	4	0	0	5	2	0	0	25	6	0	0	2	N	N	16.25	6.75	23.00
02/02	6	1	0	0	17	1	0	0	23	2	0	0	2	N	N	16.50	6.50	23.00
02/03	7	2	0	0	1	0	0	0	8	2	0	0	2	N	N	16.00	5.25	21.25
02/04	9	3	0	0	2	0	0	0	11	3	0	0	2	N	N	16.25	3.50	19.75
02/05	34	7	1	0	1	0	0	0	35	7	1	0	2	N	N	15.75	6.75	22.50
02/06	10	2	0	0	0	0	0	0	10	2	0	0	2	N	N	16.25	6.75	23.00
02/07	43	21	0	0	3	1	1	0	46	22	1	0	2	N	N	16.25	6.75	23.00
02/08	17	3	0	0	5	3	0	0	22	6	0	0	2	N	N	16.00	6.50	22.50
02/09	8	1	0	0	1	0	0	0	9	1	0	0	2	N	N	16.25	6.50	22.75
02/10	8	1	0	0	1	0	0	0	9	1	0	0	2	N	N	16.25	6.50	22.75
02/11	6	1	1	0	0	0	0	0	6	1	1	0	2	N	N	16.25	7.00	23.25
02/12	2	1	0	0	0	0	0	0	2	1	0	0	2	N	N	15.75	6.75	22.50
02/13	7	1	0	0	0	0	0	0	7	1	0	0	2	N	N	16.00	6.75	22.75
02/14	2	0	0	1	0	0	0	0	2	0	0	1	2	N	N	16.25	6.25	22.50
02/15	6	1	1	0	0	0	0	0	6	1	1	0	2	N	N	16.25	7.50	23.75
02/16	5	1	1	0	0	0	0	0	5	1	1	0	2	N	N	16.50	7.75	24.25
02/17	5	0	1	0	0	0	0	0	5	0	1	0	2	N	N	16.25	6.75	23.00

Appendix 1. 1993-94 Downstream Migrant Database - October 1993 - July 1994

Age 1 Fall Chinook Salmon

Woodbridge Dam

	AGE 1+ NOCTURNAL TOTALS				AGE 1+ DIURNAL TOTALS				AGE 1+ DAILY TOTALS				DOWNSTREAM MIGRANT TRAP OPERATIONS DATA					
																Time Fished		
Date	Number Captured	Number Ad Clips	Number Injuries	Number Mortality	Number Captured	Number Ad Clips	Number Injuries	Number Mortality	GrandTotal Captured	randTotal Ad Clips	randTotal Injuries	GrandTotal Mortality	# of Screw Traps	L.S. Fishway Trap (Y/N)	H.S. Fishway Trap (Y/N)	Nocturnal	Diurnal	Total
02/18	29	7	4	0	13	5	0	0	42	12	4	0	2	N	N	16.50	6.25	22.75
02/19	19	10	2	1	0	0	0	0	19	10	2	1	2	N	N	17.00	7.00	24.00
02/20	5	2	0	0	0	0	0	0	5	2	0	0	2	N	N	17.00	7.00	24.00
02/21	2	0	0	0	0	0	0	0	2	0	0	0	2	N	N	17.00	7.00	24.00
02/22	0	0	0	0	0	0	0	0	0	0	0	0	2	N	N	17.00	7.50	24.50
02/23	2	1	1	0	0	0	0	0	2	1	1	0	2	N	N	16.25	7.50	23.75
02/24	0	0	0	0	0	0	0	0	0	0	0	0	2	N	N	16.00	7.50	23.50
02/25	0	0	0	0	0	0	0	0	0	0	0	0	2	N	N	16.00	6.50	22.50
02/26	3	0	1	0	0	0	0	0	3	0	1	0	2	N	N	16.25	7.50	23.75
02/27	0	0	0	0	0	0	0	0	0	0	0	0	2	N	N	16.25	7.50	23.75
02/28	0	0	0	0	0	0	0	0	0	0	0	0	2	N	N	16.50	7.50	24.00
03/01	2	0	0	0	0	0	0	0	2	0	0	0	2	N	N	16.50	7.50	24.00
03/02	0	0	0	0	0	0	0	0	0	0	0	0	2	N	N	16.00	7.25	23.25
03/03	2	0	1	0	0	0	0	0	2	0	1	0	2	N	N	16.25	7.50	23.75
03/04	0	0	0	0	0	0	0	0	0	0	0	0	2	N	N	16.00	7.25	23.25
03/05	0	0	0	0	0	0	0	0	0	0	0	0	2	N	N	16.50	7.00	23.50
03/06	2	0	0	0	0	0	0	0	2	0	0	0	2	N	N	16.25	7.50	23.75
03/07	1	0	0	0	0	0	0	0	1	0	0	0	2	N	N	16.00	7.50	23.50
03/08	0	0	0	0	0	0	0	0	0	0	0	0	2	N	N	16.00	7.25	23.25
03/09	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	17.00	7.00	24.00
03/10	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.00	7.00	23.00
03/11	1	0	0	0	0	0	0	0	1	0	0	0	1	N	N	16.25	6.00	22.25
03/12	2	0	0	0	0	0	0	0	2	0	0	0	1	N	N	16.25	7.00	23.25
03/13	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.75	6.75	23.50
03/14	1	0	0	0	0	0	0	0	1	0	0	0	1	N	N	16.00	7.00	23.00
03/15	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	6.25	22.75
03/16	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.25	7.00	23.25
03/17	0	0	0	0	1	0	0	0	1	0	0	0	1	N	N	15.75	6.75	22.50
03/18	1	0	0	0	0	0	0	0	1	0	0	0	1	N	N	16.25	7.25	23.50
03/19	1	0	0	0	0	0	0	0	1	0	0	0	1	N	N	16.25	7.25	23.50
03/20	1	0	1	0	0	0	0	0	1	0	1	0	1	N	N	16.25	6.75	23.00
03/21	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	7.25	23.75
03/22	1	0	0	0	0	0	0	0	1	0	0	0	1	N	N	16.00	6.50	22.50
03/23	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	15.75	7.00	22.75
03/24	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.25	7.25	23.50
03/25	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.25	7.25	23.50
03/26	1	1	0	0	0	0	0	0	1	1	0	0	1	N	N	16.25	6.50	22.75
03/27	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	6.75	23.25
03/28	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	7.25	23.75
03/29	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.25	7.25	23.50
03/30	0	0	0	0	1	0	0	0	1	0	0	0	1	N	N	16.25	7.00	23.25
03/31	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	7.00	23.50
04/01	0	0	0	0	1	1	0	0	1	1	0	0	1	N	N	16.50	7.50	24.00
04/02	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	15.50	7.25	22.75
04/03	0	0	0	0	1	0	0	0	1	0	0	0	1	N	N	16.25	6.75	23.00
04/04	3	1	0	0	0	0	0	0	3	1	0	0	1	N	N	16.75	7.00	23.75
04/05	1	0	0	0	1	0	0	0	2	0	0	0	1	N	N	16.50	6.75	23.25
04/06	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	7.25	23.75
04/07	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	7.00	23.50
04/08	0	0	0	0	1	0	0	0	1	0	0	0	1	N	N	16.75	7.00	23.75
04/09	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	6.75	23.25
04/10	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.25	6.50	22.75
04/11	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	7.00	23.50
04/12	0	0	0	0	1	0	0	0	1	0	0	0	1	N	N	16.50	6.50	23.00
04/13	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.25	7.00	23.25
04/14	1	0	0	0	0	0	0	0	1	0	0	0	1	N	N	16.25	7.25	23.50
04/15	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	15.75	8.25	24.00
04/16	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.00	7.00	23.00
04/17	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.25	7.00	23.25
04/18	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.25	7.25	23.50
04/19	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	7.00	23.50
04/20	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	7.00	23.50
04/21	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.25	7.00	23.25

Appendix 1. 1993-94 Downstream Migrant Database - October 1993 - July 1994

Age 1 Fall Chinook Salmon

Woodbridge Dam

Date	AGE 1+ NOCTURNAL TOTALS Number Captured	Number Ad Clips	Number Injuries	Number Mortality	AGE 1+ DIURNAL TOTALS Number Captured	Number Ad Clips	Number Injuries	Number Mortality	AGE 1+ DAILY TOTALS GrandTotal Captured	GrandTotal Ad Clips	GrandTotal Injuries	GrandTotal Mortality	DOWNSTREAM MIGRANT TRAP OPERATIONS DATA # of Screw Traps	L.S. Fishway Trap (Y/N)	H.S. Fishway Trap (Y/N)	Time Fished Nocturnal	Time Fished Diurnal	Time Fished Total
04/22	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.25	7.25	23.50
04/23	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	14.00	7.25	21.25
04/24	1	0	0	0	0	0	0	0	1	0	0	0	1	N	N	16.25	7.25	23.50
04/25	1	0	0	0	0	0	0	0	1	0	0	0	1	N	N	16.25	7.25	23.50
04/26	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.25	7.50	23.75
04/27	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	15.75	7.50	23.25
04/28	0	0	0	0	1	0	0	0	1	0	0	0	1	N	N	16.25	7.50	23.75
04/29	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	15.75	7.00	22.75
04/30	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.25	7.75	24.00
05/01	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.00	7.25	23.25
05/02	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	7.25	23.75
05/03	1	0	0	0	0	0	0	0	1	0	0	0	1	N	N	16.75	7.25	24.00
05/04	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.25	7.50	23.75
05/05	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.25	7.00	23.25
05/06	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	7.25	23.75
05/07	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	6.50	23.00
05/08	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.00	7.00	23.00
05/09	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.25	6.75	23.00
05/10	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	17.00	7.25	24.25
05/11	1	0	0	0	0	0	0	0	1	0	0	0	1	N	N	16.50	11.50	28.00
05/12	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	12.00	6.50	18.50
05/13	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.75	6.75	23.50
05/14	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	7.50	24.00
05/15	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	15.50	7.00	22.50
05/16	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	7.25	23.75
05/17	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.00	7.75	23.75
05/18	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.00	7.25	23.25
05/19	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.00	6.75	22.75
05/20	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.25	6.00	22.25
05/21	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	6.00	22.50
05/22	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	15.75	6.00	21.75
05/23	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.75	6.75	23.50
05/24	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	18.25	9.00	27.25
05/25	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	15.00	5.25	20.25
05/26	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	15.50	7.25	22.75
05/27	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.00	7.25	23.25
05/28	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	7.00	23.50
05/29	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	6.50	23.00
05/30	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.25	7.25	23.50
05/31	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	17.00	7.00	24.00
06/01	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.75	*	16.75
06/02	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	23.25	7.50	30.75
06/03	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.25	6.25	22.50
06/04	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.25	7.25	23.50
06/05	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	7.00	23.50
06/06	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	7.00	23.50
06/07	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.75	7.00	23.75
06/08	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	17.00	9.25	26.25
06/09	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	14.25	7.00	21.25
06/10	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.00	7.25	23.25
06/11	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	17.00	7.25	24.25
06/12	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	15.50	8.75	24.25
06/13	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	14.50	7.25	21.75
06/14	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.75	6.75	23.50
06/15	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	8.75	25.25
06/16	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	14.50	7.75	22.25
06/17	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	14.25	10.50	24.75
06/18	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	15.25	3.00	18.25
06/19	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	7.25	23.75
06/20	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.50	7.00	23.50
06/21	0	0	0	0	0	0	0	0	0	0	0	0	1	Y	N	16.25	8.50	24.75
06/22	0	0	0	0	0	0	0	0	0	0	0	0	1	Y	Y	15.50	*	*
06/23	0	0	0	0	0	0	0	0	0	0	0	0	0	Y	Y	*	*	*

Appendix 1. 1993-94 Downstream Migrant Database - October 1993 - July 1994

Age 1 Fall Chinook Salmon

Woodbridge Dam

Date	AGE 1+ NOCTURNAL TOTALS Number Captured	Number Ad Clips	Number Injuries	Number Mortality	AGE 1+ DIURNAL TOTALS Number Captured	Number Ad Clips	Number Injuries	Number Mortality	AGE 1+ DAILY TOTALS GrandTotal Captured	GrandTotal Ad Clips	GrandTotal Injuries	GrandTotal Mortality
06/24	0	0	0	0	0	0	0	0	0	0	0	0
06/25	0	0	0	0	0	0	0	0	0	0	0	0
06/26	0	0	0	0	0	0	0	0	0	0	0	0
06/27	0	0	0	0	0	0	0	0	0	0	0	0
06/28	0	0	0	0	0	0	0	0	0	0	0	0
06/29	0	0	0	0	0	0	0	0	0	0	0	0
06/30	0	0	0	0	0	0	0	0	0	0	0	0
07/01	0	0	0	0	0	0	0	0	0	0	0	0
07/02	0	0	0	0	0	0	0	0	0	0	0	0
07/03	0	0	0	0	0	0	0	0	0	0	0	0
07/04	0	0	0	0	0	0	0	0	0	0	0	0
07/05	0	0	0	0	0	0	0	0	0	0	0	0
07/06	0	0	0	0	0	0	0	0	0	0	0	0
07/07	0	0	0	0	0	0	0	0	0	0	0	0
07/08	0	0	0	0	0	0	0	0	0	0	0	0
07/09	0	0	0	0	0	0	0	0	0	0	0	0
07/10	0	0	0	0	0	0	0	0	0	0	0	0
07/11	0	0	0	0	0	0	0	0	0	0	0	0
07/12	0	0	0	0	0	0	0	0	0	0	0	0
07/13	0	0	0	0	0	0	0	0	0	0	0	0
07/14	0	0	0	0	0	0	0	0	0	0	0	0
07/15	0	0	0	0	0	0	0	0	0	0	0	0
07/16	0	0	0	0	0	0	0	0	0	0	0	0
07/17	0	0	0	0	0	0	0	0	0	0	0	0
07/18	0	0	0	0	0	0	0	0	0	0	0	0
07/19	0	0	0	0	0	0	0	0	0	0	0	0
07/20	0	0	0	0	0	0	0	0	0	0	0	0
07/21	0	0	0	0	0	0	0	0	0	0	0	0
07/22	0	0	0	0	0	0	0	0	0	0	0	0
07/23	0	0	0	0	1	0	0	0	1	0	0	0
07/24	0	0	0	0	0	0	0	0	0	0	0	0
07/25	0	0	0	0	0	0	0	0	0	0	0	0
07/26	0	0	0	0	0	0	0	0	0	0	0	0
07/27	0	0	0	0	0	0	0	0	0	0	0	0
07/28	0	0	0	0	0	0	0	0	0	0	0	0
07/29	0	0	0	0	0	0	0	0	0	0	0	0
07/30	0	0	0	0	0	0	0	0	0	0	0	0
07/31	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	5784	1294	15	936	1093	273	1	35	6857	1567	16	971

DOWNSTREAM MIGRANT TRAP OPERATIONS DATA

Date	# of Screw Traps	L.S. Fishway Trap (Y/N)	H.S. Fishway Trap (Y/N)	Time Fished Nocturnal	Time Fished Diurnal	Total
06/24	0	Y	Y	#	/4	/4
06/25	0	Y	Y	#	/4	/4
06/26	0	Y	Y	#	/4	/4
06/27	0	Y	Y	#	/4	/4
06/28	0	Y	Y	#	/4	/4
06/29	0	Y	Y	#	/4	/4
06/30	0	Y	Y	#	/4	/4
07/01	0	Y	Y	#	/4	/4
07/02	0	Y	Y	#	/4	/4
07/03	0	Y	Y	#	/4	/4
07/04	0	Y	Y	#	/4	/4
07/05	0	Y	Y	#	/4	/4
07/06	0	Y	Y	#	/4	/4
07/07	0	Y	Y	#	/4	/4
07/08	0	Y	Y	#	/4	/4
07/09	0	Y	Y	#	/4	/4
07/10	0	Y	Y	#	/4	/4
07/11	0	Y	Y	#	/4	/4
07/12	0	Y	Y	#	/4	/4
07/13	0	Y	Y	#	/4	/4
07/14	0	Y	Y	#	/4	/4
07/15	0	Y	Y	#	/4	/4
07/16	0	Y	Y	#	/4	/4
07/17	0	Y	Y	#	/4	/4
07/18	0	Y	Y	#	/4	/4
07/19	0	Y	Y	#	/4	/4
07/20	0	Y	Y	#	/4	/4
07/21	0	Y	Y	#	/4	/4
07/22	0	Y	Y	#	/4	/4
07/23	0	Y	Y	#	/4	/4
07/24	0	Y	Y	#	/4	/4
07/25	0	Y	Y	#	/4	/4
07/26	0	Y	Y	#	/4	/4
07/27	0	Y	Y	#	/4	/4
07/28	0	Y	Y	#	/4	/4
07/29	0	Y	Y	#	/4	/4
07/30	0	Y	Y	#	/4	/4
07/31	0	Y	Y	#	/4	/4
TOTALS				3993.00	1641.50	5570

Notes:
/1 Trapping effort cannot be computed due to missing recorded start time or end time.
/2 No afternoon trap pull due to holiday schedules; diurnal count pooled with next day's nocturnal count.
/3 No trapping due to performance of physical injury tests at WIDD.
/4 Trapping duration for each fishway-installed downstream migrant trap on accompanying detailed database for this time period.

Appendix 2. 1993-94 Downstream Migrant Database - October 1993 - July 1994

Age 0 Fall Chinook Salmon

Woodbridge Dam

	YOY NOCTURNAL TOTALS				YOY DIURNAL TOTALS				YOY DAILY TOTALS				DOWNSTREAM MIGRANT TRAP OPERATIONS DATA					
																Time Fished		
Date	Number Captured	Number Mortality	Number Injuries	Number CWT	Number Captured	Number Mortality	Number Injuries	Number CWT	GrandTotal Captured	GrandTotal Mortality	GrandTotal Injuries	Grand Total CWT	# of Screw Traps	L.S. Fishway Trap (Y/N)	H.S. Fishway Trap (Y/N)	Nocturnal	Diurnal	Total
10/15									0	0	0	0	0	N	N			0.00
10/16									0	0	0	0	0	N	N			0.00
10/17									0	0	0	0	0	N	N			0.00
10/18									0	0	0	0	0	N	N			0.00
10/19									0	0	0	0	0	N	N			0.00
10/20									0	0	0	0	0	N	N			0.00
10/21	0				0				0	0	0	0	2	N	N	n	8.00	n
10/22	0				0				0	0	0	0	2	N	N	16.00	8.00	24.00
10/23	0				0				0	0	0	0	2	N	N	16.00	7.50	23.50
10/24	0				0				0	0	0	0	2	N	N	16.50	7.00	23.50
10/25	0				0				0	0	0	0	2	N	N	17.00	7.00	24.00
10/26	0				0				0	0	0	0	2	N	N	17.00	n	n
10/27	0				0				0	0	0	0	1	N	N	n	8.00	n
10/28	0				0				0	0	0	0	1	N	N	16.00	8.00	24.00
10/29	0				0				0	0	0	0	2	N	N	16.00	7.50	23.50
10/30	0				0				0	0	0	0	2	N	N	16.00	7.50	23.50
10/31	0				0				0	0	0	0	2	N	N	16.00	n	n
11/01	0				0				0	0	0	0	2	N	N	n		n
11/02	0				0				0	0	0	0	0	N	N			0.00
11/03	0				0				0	0	0	0	2	N	N		8.50	8.50
11/04	0				0				0	0	0	0	2	N	N	17.00	6.50	23.50
11/05	0				0				0	0	0	0	2	N	N	16.50	7.50	24.00
11/06	0				0				0	0	0	0	2	N	N	16.50	7.50	24.00
11/07	0				0				0	0	0	0	2	N	N	16.50	7.00	23.50
11/08	0				0				0	0	0	0	2	N	N	17.00	7.50	24.50
11/09	0				0				0	0	0	0	2	N	N	15.50	8.50	24.00
11/10	0				0				0	0	0	0	2	N	N	16.50	7.00	23.50
11/11	0				0				0	0	0	0	2	N	N	17.50	6.50	24.00
11/12	0				0				0	0	0	0	2	N	N	17.00	7.00	24.00
11/13	0				0				0	0	0	0	2	N	N	17.00	7.00	24.00
11/14	0				0				0	0	0	0	2	N	N	17.50	6.50	24.00
11/15	0				0				0	0	0	0	2	N	N	17.00	7.00	24.00
11/16	0				0				0	0	0	0	2	N	N	17.00	7.00	24.00
11/17	0				0				0	0	0	0	2	N	N	17.00	6.50	23.50
11/18	0				0				0	0	0	0	2	N	N	18.00	6.50	24.50
11/19	0				0				0	0	0	0	2	N	N	17.50	6.00	23.50
11/20	0				0				0	0	0	0	2	N	N	18.00	7.00	25.00
11/21	0				0				0	0	0	0	2	N	N	16.50	7.00	23.50
11/22	0				0				0	0	0	0	2	N	N	17.00	7.50	24.50
11/23	0				0				0	0	0	0	2	N	N	17.00	6.50	23.50
11/24	0				0				0	0	0	0	2	N	N	17.50	6.50	24.00
11/25	0				0				0	0	0	0	2	N	N	16.50	d	16.50
11/26	0				0				0	0	0	0	2	N	N	24.50	7.00	31.50
11/27	0				0				0	0	0	0	2	N	N	17.00	6.00	23.00
11/28	0				0				0	0	0	0	2	N	N	18.00	6.50	24.50
11/29	0				0				0	0	0	0	2	N	N	18.00	6.00	24.00
11/30	0				0				0	0	0	0	2	N	N	17.50	6.00	23.50
12/01	0				0				0	0	0	0	2	N	N	18.00	6.00	24.00
12/02	0				0				0	0	0	0	2	N	N	18.00	5.50	23.50
12/03	0				0				0	0	0	0	2	N	N	18.50	6.00	24.50
12/04	0				0				0	0	0	0	2	N	N	18.00	6.00	24.00
12/05	0				0				0	0	0	0	2	N	N	18.00	6.00	24.00
12/06	0				0				0	0	0	0	2	N	N	18.00	6.50	24.50
12/07	0				0				0	0	0	0	2	N	N	17.00	6.50	23.50
12/08	0				0				0	0	0	0	2	N	N	17.50	6.00	23.50
12/09	0				0				0	0	0	0	2	N	N	18.00	6.00	24.00
12/10	0				0				0	0	0	0	2	N	N	18.00	6.00	24.00
12/11	0				0				0	0	0	0	2	N	N	18.00	6.00	24.00
12/12	0				0				0	0	0	0	2	N	N	17.50	6.50	24.00
12/13	0				0				0	0	0	0	2	N	N	17.50	6.50	24.00
12/14	0				0				0	0	0	0	2	N	N	17.50	6.50	24.00
12/15	0				0				0	0	0	0	2	N	N	17.50	6.50	24.00
12/16	0				0				0	0	0	0	2	N	N	17.50	6.50	24.00
12/17	0				0				0	0	0	0	2	N	N	17.00	7.00	24.00
12/18	0				0				0	0	0	0	2	N	N	17.50	6.00	23.50
12/19	0				0				0	0	0	0	2	N	N	17.50	6.50	24.00

Appendix 2. 1993-94 Downstream Migrant Database - October 1993 - July 1994

Age 0 Fall Chinook Salmon

Woodbridge Dam

	YOY NOCTURNAL TOTALS				YOY DIURNAL TOTALS				YOY DAILY TOTALS				DOWNSTREAM MIGRANT TRAP OPERATIONS DATA					
																Time Fished		
Date	Number Captured	Number Mortality	Number Injuries	Number CWT	Number Captured	Number Mortality	Number Injuries	Number CWT	GrandTotal Captured	GrandTotal Mortality	GrandTotal Injuries	Grand Total CWT	# of Screw Traps	L.S. Fishway Trap (Y/N)	H.S. Fishway Trap (Y/N)	Nocturnal	Diurnal	Total
12/20	0				0				0	0	0	0	2	N	N	17.50	6.50	24.00
12/21	0				0				0	0	0	0	2	N	N	17.50	6.50	24.00
12/22	0				0				0	0	0	0	2	N	N	17.50	6.50	24.00
12/23	0				0				0	0	0	0	2	N	N	17.50	6.50	24.00
12/24	0				0				0	0	0	0	2	N	N	17.50	7.00	24.50
12/25	0				0				0	0	0	0	2	N	N	17.00	a	17.00
12/26	0				0				0	0	0	0	2	N	N	23.50	6.00	29.50
12/27	0				0				0	0	0	0	2	N	N	17.50	6.50	24.00
12/28	0				0				0	0	0	0	2	N	N	17.50	6.50	24.00
12/29	0				0				0	0	0	0	2	N	N	17.50	6.50	24.00
12/30	0				0				0	0	0	0	2	N	N	17.50	6.50	24.00
12/31	0				0				0	0	0	0	2	N	N	17.50	6.50	24.00
01/01	0				0				0	0	0	0	2	N	N	17.00	a	17.00
01/02	0				0				0	0	0	0	2	N	N	24.00	7.00	31.00
01/03	0				0				0	0	0	0	2	N	N	17.00	7.00	24.00
01/04	0				0				0	0	0	0	2	N	N	17.00	7.00	24.00
01/05	0				0				0	0	0	0	2	N	N	17.00	7.00	24.00
01/06	0				0				0	0	0	0	2	N	N	17.00	7.00	24.00
01/07	0				0				0	0	0	0	2	N	N	17.00	7.00	24.00
01/08	0				0				0	0	0	0	2	N	N	17.00	7.00	24.00
01/09	0				0				0	0	0	0	2	N	N	17.00	7.00	24.00
01/10	0				0				0	0	0	0	2	N	N	17.00	7.00	24.00
01/11	0				0				0	0	0	0	2	N	N	17.00	7.00	24.00
01/12	0				0				0	0	0	0	2	N	N	17.00	6.50	23.50
01/13	0				0				0	0	0	0	2	N	N	16.75	6.50	23.25
01/14	0				0				0	0	0	0	2	N	N	16.50	6.50	23.00
01/15	0				0				0	0	0	0	2	N	N	16.50	6.75	23.25
01/16	0				0				0	0	0	0	2	N	N	16.00	7.50	23.50
01/17	0				0				0	0	0	0	2	N	N	15.75	6.75	22.50
01/18	0				0				0	0	0	0	2	N	N	16.25	6.75	23.00
01/19	0				0				0	0	0	0	2	N	N	16.25	7.00	23.25
01/20	0				0				0	0	0	0	2	N	N	16.75	6.75	23.50
01/21	0				0				0	0	0	0	2	N	N	16.25	6.75	23.00
01/22	0				0				0	0	0	0	2	N	N	16.25	6.75	23.00
01/23	0				0				0	0	0	0	2	N	N	16.25	7.25	23.50
01/24	0				0				0	0	0	0	2	N	N	16.25	6.50	22.75
01/25	0				0				0	0	0	0	2	N	N	16.50	7.25	23.75
01/26	0				0				0	0	0	0	2	N	N	15.75	7.50	23.25
01/27	0				0				0	0	0	0	2	N	N	15.75	7.00	22.75
01/28	0				0				0	0	0	0	2	N	N	16.00	7.50	23.50
01/29	0				0				0	0	0	0	2	N	N	15.50	6.50	22.00
01/30	1				0				1	0	0	0	2	N	N	16.25	6.50	22.75
01/31	0				4				4	0	0	0	2	N	N	16.25	6.50	22.75
02/01	2	0	0		0	0	0		2	0	0	0	2	N	N	16.25	6.75	23.00
02/02	0	0	0		0	0	0		0	0	0	0	2	N	N	16.50	6.50	23.00
02/03	0	0	0		0	0	0		0	0	0	0	2	N	N	16.00	5.25	21.25
02/04	4	0	0		0	0	0		4	0	0	0	2	N	N	16.25	3.50	19.75
02/05	0	0	0		0	0	0		0	0	0	0	2	N	N	15.75	6.75	22.50
02/06	0	0	0		0	0	0		0	0	0	0	2	N	N	16.25	6.75	23.00
02/07	0	0	0		0	0	0		0	0	0	0	2	N	N	16.25	6.75	23.00
02/08	1	0	0		1	0	0		2	0	0	0	2	N	N	16.00	6.50	22.50
02/09	1	0	0		0	0	0		1	0	0	0	2	N	N	16.25	6.50	22.75
02/10	0	0	0		4	0	0		4	0	0	0	2	N	N	16.25	6.50	22.75
02/11	3	0	0		2	0	0		5	0	0	0	2	N	N	16.25	7.00	23.25
02/12	10	0	0		3	0	0		13	0	0	0	2	N	N	15.75	6.75	22.50
02/13	5	0	0		0	0	0		5	0	0	0	2	N	N	16.00	6.75	22.75
02/14	16	0	0		1	0	0		17	0	0	0	2	N	N	16.25	6.25	22.50
02/15	13	1	0		1	0	0		14	1	0	0	2	N	N	16.25	7.50	23.75
02/16	6	0	0		2	0	0		8	0	0	0	2	N	N	16.50	7.75	24.25
02/17	1	0	0		5	0	0		6	0	0	0	2	N	N	16.25	6.75	23.00
02/18	1	0	0		2	0	0		3	0	0	0	2	N	N	16.50	6.25	22.75
02/19	0	0	0		0	0	0		0	0	0	0	2	N	N	17.00	7.00	24.00
02/20	3	0	0		0	0	0		3	0	0	0	2	N	N	17.00	7.00	24.00
02/21	1	0	0		0	0	0		1	0	0	0	2	N	N	17.00	7.00	24.00
02/22	0	0	0		0	0	0		0	0	0	0	2	N	N	17.00	7.50	24.50
02/23	3	0	0		2	1	0		5	1	0	0	2	N	N	16.25	7.50	23.75

Appendix 2. 1993-94 Downstream Migrant Database - October 1993 - July 1994

Age 0 Fall Chinook Salmon

Woodbridge Dam

Date	YOY NOCTURNAL TOTALS Number Captured	YOY NOCTURNAL TOTALS Number Mortality	YOY NOCTURNAL TOTALS Number Injuries	YOY NOCTURNAL TOTALS Number CWT	YOY DIURNAL TOTALS Number Captured	YOY DIURNAL TOTALS Number Mortality	YOY DIURNAL TOTALS Number Injuries	YOY DIURNAL TOTALS Number CWT	YOY DAILY TOTALS GrandTotal Captured	YOY DAILY TOTALS GrandTotal Mortality	YOY DAILY TOTALS GrandTotal Injuries	YOY DAILY TOTALS Grand Total CWT	DOWNSTREAM MIGRANT TRAP OPERATIONS DATA # of Screw Traps	L.S. Fishway Trap (Y/N)	H.S. Fishway Trap (Y/N)	Time Fished Nocturnal	Time Fished Diurnal	Time Fished Total
02/24	7	1	0		0	0	0		7	1	0	0	2	N	N	16.00	7.50	23.50
02/25	1	0	0		1	0	0		2	0	0	0	2	N	N	16.00	6.50	22.50
02/26	0	0	0		0	0	0		0	0	0	0	2	N	N	16.25	7.50	23.75
02/27	3	0	0		0	0	0		3	0	0	0	2	N	N	16.25	7.50	23.75
02/28	1	0	0		0	0	0		1	0	0	0	2	N	N	16.50	7.50	24.00
03/01	1	0	0		2	0	0		3	0	0	0	2	N	N	16.50	7.50	24.00
03/02	2	0	1		0	0	0		2	0	1	0	2	N	N	16.00	7.25	23.25
03/03	1	0	0		0	0	0		1	0	0	0	2	N	N	16.25	7.50	23.75
03/04	1	0	0		0	0	0		1	0	0	0	2	N	N	16.00	7.25	23.25
03/05	2	0	0		0	0	0		2	0	0	0	2	N	N	16.50	7.00	23.50
03/06	0	0	0		0	0	0		0	0	0	0	2	N	N	16.25	7.50	23.75
03/07	0	0	0		0	0	0		0	0	0	0	2	N	N	16.00	7.50	23.50
03/08	2	0	0		0	0	0		2	0	0	0	2	N	N	16.00	7.25	23.25
03/09	0	0	0		0	0	0		0	0	0	0	1	N	N	17.00	7.00	24.00
03/10	0	0	0		0	0	0		0	0	0	0	1	N	N	16.00	7.00	23.00
03/11	0	0	0		0	0	0		0	0	0	0	1	N	N	16.25	6.00	22.25
03/12	0	0	0		0	0	0		0	0	0	0	1	N	N	16.25	7.00	23.25
03/13	0	0	0		0	0	0		0	0	0	0	1	N	N	16.75	6.75	23.50
03/14	0	0	0		0	0	0		0	0	0	0	1	N	N	16.00	7.00	23.00
03/15	0	0	0		0	0	0		0	0	0	0	1	N	N	16.50	6.25	22.75
03/16	0	0	0		0	0	0		0	0	0	0	1	N	N	16.25	7.00	23.25
03/17	0	0	0		1	0	0		1	0	0	0	1	N	N	15.75	6.75	22.50
03/18	0	0	0		0	0	0		0	0	0	0	1	N	N	16.25	7.25	23.50
03/19	1	0	0		0	0	0		1	0	0	0	1	N	N	16.25	7.25	23.50
03/20	0	0	0		0	0	0		0	0	0	0	1	N	N	16.25	6.75	23.00
03/21	0	0	0		0	0	0		0	0	0	0	1	N	N	16.50	7.25	23.75
03/22	0	0	0		0	0	0		0	0	0	0	1	N	N	16.00	6.50	22.50
03/23	0	0	0		0	0	0		0	0	0	0	1	N	N	15.75	7.00	22.75
03/24	0	0	0		0	0	0		0	0	0	0	1	N	N	16.25	7.25	23.50
03/25	0	0	0		0	0	0		0	0	0	0	1	N	N	16.25	7.25	23.50
03/26	0	0	0		0	0	0		0	0	0	0	1	N	N	16.25	6.50	22.75
03/27	0	0	0		0	0	0		0	0	0	0	1	N	N	16.50	6.75	23.25
03/28	0	0	0		0	0	0		0	0	0	0	1	N	N	16.50	7.25	23.75
03/29	0	0	0		0	0	0		0	0	0	0	1	N	N	16.25	7.25	23.50
03/30	0	0	0		1	0	0		1	0	0	0	1	N	N	16.25	7.00	23.25
03/31	0	0	0		0	0	0		0	0	0	0	1	N	N	16.50	7.00	23.50
04/01	0	0	0	0	1	0	0	0	1	0	0	0	1	N	N	16.50	7.50	24.00
04/02	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	15.50	7.25	22.75
04/03	0	0	0	0	0	0	0	0	0	0	0	0	1	N	N	16.25	6.75	23.00
04/04	1	0	0	0	0	0	0	0	1	0	0	0	1	N	N	16.75	7.00	23.75
04/05	2	0	0	0	0	0	0	0	2	0	0	0	1	N	N	16.50	6.75	23.25
04/06	5	0	0	0	0	0	0	0	5	0	0	0	1	N	N	16.50	7.25	23.75
04/07	14	0	0	0	0	0	0	0	14	0	0	0	1	N	N	16.50	7.00	23.50
04/08	7	0	0	5	0	0	0	0	7	0	0	5	1	N	N	16.75	7.00	23.75
04/09	7	0	0	7	0	0	0	0	7	0	0	7	1	N	N	16.50	6.75	23.25
04/10	43	1	1	42	0	0	0	0	43	1	1	42	1	N	N	16.25	6.50	22.75
04/11	68	2	1	59	0	0	0	0	68	2	1	59	1	N	N	16.50	7.00	23.50
04/12	15	0	0	14	2	0	0	2	17	0	0	16	1	N	N	16.50	6.50	23.00
04/13	49	1	1	39	3	0	0	2	52	1	1	41	1	N	N	16.25	7.00	23.25
04/14	53	3	0	47	1	0	0	1	54	3	0	48	1	N	N	16.25	7.25	23.50
04/15	48	1	0	47	3	0	0	3	51	1	0	50	1	N	N	15.75	8.25	24.00
04/16	24	0	0	21	0	0	0	0	24	0	0	21	1	N	N	16.00	7.00	23.00
04/17	63	0	1	61	0	0	0	0	63	0	1	61	1	N	N	16.25	7.00	23.25
04/18	95	1	0	92	0	0	0	0	95	1	0	92	1	N	N	16.25	7.25	23.50
04/19	97	2	2	93	17	0	0	16	114	2	2	109	1	N	N	16.50	7.00	23.50
04/20	546	3	2	540	26	1	1	25	572	4	3	565	1	N	N	16.50	7.00	23.50
04/21	199	1	4	198	11	0	0	11	210	1	4	209	1	N	N	16.25	7.00	23.25
04/22	224	2	0	220	9	0	1	9	233	2	1	229	1	N	N	16.25	7.25	23.50
04/23	127	1	3	124	6	0	1	6	133	1	4	130	1	N	N	14.00	7.25	21.25
04/24	77	1	2	74	5	0	0	5	82	1	2	79	1	N	N	16.25	7.25	23.50
04/25	144	1	2	135	0	0	0	0	144	1	2	135	1	N	N	16.25	7.25	23.50
04/26	341	0	5	340	14	0	0	14	355	0	5	354	1	N	N	16.25	7.50	23.75
04/27	478	3	11	474	26	1	0	25	504	4	11	499	1	N	N	15.75	7.50	23.25
04/28	219	2	4	216	5	0	0	5	224	2	4	221	1	N	N	16.25	7.50	23.75
04/29	249	3	6	246	10	0	2	10	259	3	8	258	1	N	N	15.75	7.00	22.75
04/30	68	0	1	68	10	0	0	10	78	0	1	78	1	N	N	16.25	7.75	24.00

Appendix 2. 1993-94 Downstream Migrant Database - October 1993 - July 1994

Age 0 Fall Chinook Salmon

Woodbridge Dam

	YOY NOCTURNAL TOTALS				YOY DIURNAL TOTALS				YOY DAILY TOTALS				DOWNSTREAM MIGRANT TRAP OPERATIONS DATA			Time Fished		
Date	Number Captured	Number Mortality	Number Injuries	Number CWT	Number Captured	Number Mortality	Number Injuries	Number CWT	GrandTotal Captured	GrandTotal Mortality	GrandTotal Injuries	Grand Total CWT	# of Screw Traps	L.S. Fishway Trap (Y/N)	H.S. Fishway Trap (Y/N)	Nocturnal	Diurnal	Total
05/01	103	0	0	103	3	0	0	3	106	0	0	106	1	N	N	16.00	7.25	23.25
05/02	108	0	0	108	0	0	0	0	108	0	0	108	1	N	N	16.50	7.25	23.75
05/03	197	0	8	196	5	0	1	5	202	0	9	201	1	N	N	16.75	7.25	24.00
05/04	132	0	2	132	26	1	0	25	158	1	2	157	1	N	N	16.25	7.50	23.75
05/05	222	8	1	212	8	2	0	6	230	10	1	218	1	N	N	16.25	7.00	23.25
05/06	77	0	0	76	5	0	0	5	82	0	0	81	1	N	N	16.50	7.25	23.75
05/07	199	2	10	190	45	3	1	42	244	5	11	232	1	N	N	16.50	6.50	23.00
05/08	491	6	5	481	12	0	0	12	503	6	5	493	1	N	N	16.00	7.00	23.00
05/09	359	4	8	355	13	0	0	13	372	4	8	368	1	N	N	16.25	6.75	23.00
05/10	67	1	2	59	50	3	2	47	117	4	4	106	1	N	N	17.00	7.25	24.25
05/11	227	7	4	220	14	0	1	14	241	7	5	234	1	N	N	16.50	11.50	28.00
05/12	294	3	3	289	2	1	0	1	296	4	3	290	1	N	N	12.00	6.50	18.50
05/13	50	0	0	50	27	0	1	27	77	0	1	77	1	N	N	16.75	6.75	23.50
05/14	22	0	0	22	16	0	2	16	38	0	2	38	1	N	N	16.50	7.50	24.00
05/15	173	3	4	170	7	0	0	7	180	3	4	177	1	N	N	15.50	7.00	22.50
05/16	86	1	2	85	0	0	0	0	86	1	2	85	1	N	N	16.50	7.25	23.75
05/17	8	0	0	7	0	0	0	0	8	0	0	7	1	N	N	16.00	7.75	23.75
05/18	78	2	4	74	41	2	1	39	119	4	5	113	1	N	N	16.00	7.25	23.25
05/19	17	0	3	17	2	0	0	2	19	0	3	19	1	N	N	16.00	6.75	22.75
05/20	76	4	1	59	114	7	1	107	190	11	2	166	1	N	N	16.25	6.00	22.25
05/21	42	1	2	41	45	1	2	44	87	2	4	85	1	N	N	16.50	6.00	22.50
05/22	91	3	0	88	21	0	1	21	112	3	1	109	1	N	N	15.75	6.00	21.75
05/23	44	1	2	43	6	0	0	0	50	1	2	43	1	N	N	16.75	6.75	23.50
05/24	20	0	0	20	9	0	0	8	29	0	0	28	1	N	N	18.25	9.00	27.25
05/25	74	0	0	73	2	1	0	1	76	1	0	74	1	N	N	15.00	5.25	20.25
05/26	19	2	1	17	7	0	0	7	26	2	1	24	1	N	N	15.50	7.25	22.75
05/27	41	1	0	40	11	1	1	10	52	2	1	50	1	N	N	16.00	7.25	23.25
05/28	17	0	1	17	0	0	0	0	17	0	1	17	1	N	N	16.50	7.00	23.50
05/29	10	0	2	8	1	0	1	1	11	0	3	9	1	N	N	16.50	6.50	23.00
05/30	21	1	2	20	0	0	0	0	21	1	2	20	1	N	N	16.25	7.25	23.50
05/31	1	0	0	1	10	0	0	10	11	0	0	11	1	N	N	17.00	7.00	24.00
06/01	12	0	2	12	a				12	0	2	12	1	N	N	16.75	a	18.75
06/02	34	0	2	33	2	0	0	2	36	0	2	35	1	N	N	23.25	7.50	30.75
06/03	23	0	2	23	5	1	0	4	28	1	2	27	1	N	N	16.25	6.25	22.50
06/04	15	0	1	15	10	0	0	10	25	0	1	25	1	N	N	16.25	7.25	23.50
06/05	9	0	1	9	0	0	0	0	9	0	1	9	1	N	N	16.50	7.00	23.50
06/06	4	0	0	4	0	0	0	0	4	0	0	4	1	N	N	16.50	7.00	23.50
06/07	1	0	0	1	0	0	0	0	1	0	0	1	1	N	N	16.75	7.00	23.75
06/08	3	0	0	3	8	0	0	7	11	0	0	10	1	N	N	17.00	9.25	26.25
06/09	20	0	2	20	5	0	0	3	25	0	2	23	1	N	N	14.25	7.00	21.25
06/10	29	2	1	13	12	0	0	9	41	2	1	22	1	N	N	16.00	7.25	23.25
06/11	15	1	1	14	3	0	0	3	18	1	1	17	1	N	N	17.00	7.25	24.25
06/12	2	0	1	2	0	0	0	0	2	0	1	2	1	N	N	15.50	8.75	24.25
06/13	1	0	0	1	0	0	0	0	1	0	0	1	1	N	N	14.50	7.25	21.75
06/14	19	0	0	17	21	1	0	20	40	1	0	37	1	N	N	16.75	6.75	23.50
06/15	12	0	1	11	10	0	1	10	22	0	2	21	1	N	N	16.50	8.75	25.25
06/16	10	0	0	10	3	0	0	3	13	0	0	13	1	N	N	14.50	7.75	22.25
06/17	10	0	1	10	1	0	0	1	11	0	1	11	1	N	N	14.25	10.50	24.75
06/18	5	0	0	5	1	0	0	1	6	0	0	6	1	N	N	15.25	3.00	18.25
06/19	9	0	0	9	0	0	0	0	9	0	0	9	1	N	N	16.50	7.25	23.75
06/20	17	0	0	17	0	0	0	0	17	0	0	17	1	N	N	16.50	7.00	23.50
06/21	42	0	1	37	12	0	0	12	54	0	1	49	1	Y	N	16.25	8.50	24.75
06/22	69	0	3	63	*Screw Trap Removed; H.S. Fishway Trap Installed.*				69	0	3	63	1	Y	Y	15.50	a	a
06/23	96	3	3	80	28	0	0	24	124	3	3	104	0	Y	Y	a	a	a
06/24	48	0	1	40	14	0	2	14	62	0	3	54	0	Y	Y	a	a	a
06/25	87	1	3	86	17	0	1	17	104	1	4	103	0	Y	Y	a	a	a
06/26	101	4	2	97	11	0	0	11	112	4	2	108	0	Y	Y	a	a	a
06/27	51	0	2	51	21	0	1	20	72	0	3	71	0	Y	Y	a	a	a
06/28	34	1	0	33	7	0	3	7	41	1	3	40	0	Y	Y	a	a	a
06/29	48	2	3	46	3	0	1	3	51	2	4	49	0	Y	Y	a	a	a
06/30	33	0	2	33	8	0	1	7	41	0	3	40	0	Y	Y	a	a	a
07/01	24	0	1	24	5	0	0	5	29	0	1	29	0	Y	Y	a	a	a
07/02	11	1	0	10	7	0	0	7	18	1	0	17	0	Y	Y	a	a	a
07/03	21	0	0	21	5	1	0	4	26	1	0	25	0	Y	Y	a	a	a
07/04	16	0	1	16	1	0	0	1	17	0	1	17	0	Y	Y	a	a	a
07/05	31	0	1	31	17	0	0	17	48	0	1	48	0	Y	Y	a	a	a

Appendix 2. 1993-94 Downstream Migrant Database - October 1993 - July 1994

Date	YOY NOCTURNAL TOTALS Number Captured	Number Mortality	Number Injuries	Number CWT	YOY DIURNAL TOTALS Number Captured	Number Mortality	Number Injuries	Number CWT
07/06	13	0	0	13	0	0	0	0
07/07	14	0	0	14	10	0	2	10
07/08	18	0	1	18	1	0	0	1
07/09	32	0	0	27	22	0	0	22
07/10	50	1	0	44	18	0	0	11
07/11	38	0	0	38	5	0	0	5
07/12	14	0	1	14	11	2	0	9
07/13	17	1	0	16	4	0	0	4
07/14	17	0	1	16	7	0	0	7
07/15	14	1	0	13	1	0	0	1
07/16	16	0	0	16	1	0	0	1
07/17	5	0	0	5	1	0	0	1
07/18	5	1	0	4	4	1	1	3
07/19	8	0	0	8	0	0	0	0
07/20	5	1	0	4	0	0	0	0
07/21	5	0	0	3	2	0	0	0
07/22	1	0	0	0	0	0	0	0
07/23	5	1	0	0	5	0	0	2
07/24	7	0	0	7	0	0	0	0
07/25	7	0	0	7	0	0	0	0
07/26	4	1	0	2	1	0	0	1
07/27	3	0	0	3	2	0	1	0
07/28	4	1	0	3	3	0	0	3
07/29	2	0	0	2	0	0	0	0
07/30	4	0	1	4	3	0	0	3
07/31	1	1	0	0	0	0	0	0
TOTALS	7993	104	156	7813	1021	31	34	923

Notes:
/1 Trapping effort cannot be computed due to missing recorded start time or end time.
/2 No afternoon trap pull due to holiday schedules; diurnal count pooled with next day's nocturnal count.
/3 No trapping due to performance of physical injury tests at WIDD.
/4 Trapping duration for each fishway-installed downstream migrant trap on accompanying detailed database for this time period.

Age 0 Fall Chinook Salmon
YOY DAILY TOTALS

Date	GrandTotal Captured	GrandTotal Mortality	GrandTotal Injuries	Grand Total CWT
07/06	13	0	0	13
07/07	24	0	2	24
07/08	19	0	1	19
07/09	54	0	0	49
07/10	68	1	0	55
07/11	43	0	0	43
07/12	25	2	1	23
07/13	21	1	0	20
07/14	24	0	1	23
07/15	15	1	0	14
07/16	17	0	0	17
07/17	6	0	0	6
07/18	9	2	1	7
07/19	8	0	0	8
07/20	5	1	0	4
07/21	7	0	0	3
07/22	1	0	0	0
07/23	10	1	0	2
07/24	7	0	0	7
07/25	7	0	0	7
07/26	5	1	0	3
07/27	5	0	1	3
07/28	7	1	0	6
07/29	2	0	0	2
07/30	7	0	1	7
07/31	1	1	0	0
TOTALS	9014	135	190	8536

Woodbridge Dam
DOWNSTREAM MIGRANT TRAP OPERATIONS DATA

Date	# of Screw Traps	L.S. Fishway Trap (Y/N)	H.S. Fishway Trap (Y/N)	Time Fished Nocturnal	Diurnal	Total
07/06	0	Y	Y	/4	/4	/4
07/07	0	Y	Y	/4	/4	/4
07/08	0	Y	Y	/4	/4	/4
07/09	0	Y	Y	/4	/4	/4
07/10	0	Y	Y	/4	/4	/4
07/11	0	Y	Y	/4	/4	/4
07/12	0	Y	Y	/4	/4	/4
07/13	0	Y	Y	/4	/4	/4
07/14	0	Y	Y	/4	/4	/4
07/15	0	Y	Y	/4	/4	/4
07/16	0	Y	Y	/4	/4	/4
07/17	0	Y	Y	/4	/4	/4
07/18	0	Y	Y	/4	/4	/4
07/19	0	Y	Y	/4	/4	/4
07/20	0	Y	Y	/4	/4	/4
07/21	0	Y	Y	/4	/4	/4
07/22	0	Y	Y	/4	/4	/4
07/23	0	Y	Y	/4	/4	/4
07/24	0	Y	Y	/4	/4	/4
07/25	0	Y	Y	/4	/4	/4
07/26	0	Y	Y	/4	/4	/4
07/27	0	Y	Y	/4	/4	/4
07/28	0	Y	Y	/4	/4	/4
07/29	0	Y	Y	/4	/4	/4
07/30	0	Y	Y	/4	/4	/4
07/31	0	Y	Y	/4	/4	/4
TOTALS				3993.00	1641.50	5570

Appendix 2 (continued). June - July 1994 Downstream Migrant Fishway Traps

Age 0 Fall Chinook Salmon
YOY NOCTURNAL TOTALS

Woodbridge Dam

Date	Number Captured			Number Mortality			Number Injuries			Number CWT			Time Fished		
	L.S. Fishway	H.S. Fishway	Total	L.S. Fishway	H.S. Fishway	Total	L.S. Fishway	H.S. Fishway	Total	L.S. Fishway	H.S. Fishway	Total	L.S. Fishway	H.S. Fishway	Total
06/20															
06/21	37		37	0		0	1		1			0			
06/22	67		67	0		0	3		3	61		61	22.00		22.00
06/23	12	84	96	0	3	3	0	3	3	10	70	80	18.25		18.25
06/24	11	37	48	0	0	0	0	1	1	10	30	40	16.25	16.50	32.75
06/25	7	80	87	1	0	1	0	3	3	6	80	86	16.50	16.75	33.25
06/26	32	69	101	2	2	4	0	2	2	30	67	97	17.25	16.50	33.75
06/27	8	43	51	0	0	0	0	2	2	8	43	51	18.50	17.00	35.50
06/28	8	26	34	1	0	1	0	0	0	7	26	33	17.00	17.50	34.50
06/29	5	43	48	0	2	2	1	2	3	5	41	46	17.00	17.25	34.25
06/30	9	24	33	0	0	0	1	1	2	9	24	33	17.00	17.75	34.75
07/01	5	19	24	0	0	0	0	1	1	5	19	24	16.50	17.00	33.50
07/02	6	5	11	0	1	1	0	0	0	6	4	10	17.50	18.50	36.00
07/03	14	7	21	0	0	0	0	0	0	14	7	21	16.50	16.75	33.25
07/04	14	2	16	0	0	0	1	0	1	14	2	16	18.00	18.25	36.25
07/05	20	11	31	0	0	0	1	0	1	20	11	31	17.00	17.25	34.25
07/06	8	5	13	0	0	0	0	0	0	8	5	13	17.50	17.50	35.00
07/07	11	3	14	0	0	0	0	0	0	11	3	14	17.50	17.25	34.75
07/08	10	8	18	0	0	0	1	0	1	10	8	18	16.00	16.50	32.50
07/09	4	28	32	0	0	0	0	0	0	4	23	27	14.75	15.25	30.00
07/10	11	39	50	0	1	1	0	0	0	11	33	44	14.50	14.25	28.75
07/11	16	22	38	0	0	0	0	0	0	16	22	38	15.75	16.25	32.00
07/12	12	2	14	0	0	0	0	1	1	12	2	14	16.75	17.25	34.00
07/13	3	14	17	0	1	1	0	0	0	3	13	16	16.45	16.50	32.95
07/14	4	13	17	0	0	0	0	1	1	4	12	16	17.50	17.25	34.75
07/15	1	13	14	0	1	1	0	0	0	1	12	13	16.25	16.75	33.00
07/16	3	13	16	0	0	0	0	0	0	3	13	16	16.75	17.00	33.75
07/17	3	2	5	0	0	0	0	0	0	3	2	5	17.25	17.25	34.50
07/18	0	5	5	0	1	1	0	0	0	0	4	4	16.75	16.25	33.00
07/19	3	5	8	0	0	0	0	0	0	3	5	8	12.25	18.50	30.75
07/20	4	1	5	0	1	1	0	0	0	4	0	4	15.00	14.75	29.75
07/21	4	1	5	0	0	0	0	0	0	2	1	3	16.50	17.00	33.50
07/22	1	0	1	0	0	0	0	0	0	0	0	0	16.00	17.00	33.00
07/23	2	3	5	0	1	1	0	0	0	0	0	0	24.50	16.75	41.25
07/24	0	7	7	0	0	0	0	0	0	0	7	7	16.00	16.50	32.50
07/25	0	7	7	0	0	0	0	0	0	0	7	7	17.75	18.25	36.00
07/26	1	3	4	0	1	1	0	0	0	0	2	2	16.25	16.75	33.00
07/27	1	2	3	0	0	0	0	0	0	1	2	3	16.25	17.00	33.25
07/28	0	4	4	0	1	1	0	0	0	0	3	3	16.50	16.25	32.75
07/29	2	0	2	0	0	0	0	0	0	2	0	2	16.75	16.75	33.50
07/30	1	3	4	0	0	0	1	0	1	1	3	4	16.25	16.25	32.50
07/31	0	1	1	0	1	1	0	0	0	0	0	0	16.25	17.00	33.25
TOTALS	380	654	1014	4	17	21	10	17	27	304	606	910	675.20	641.00	1316.20

Notes: Low-stage fishway began operation on 6/21/94; high-stage fishway began operation on 6/23/94.

Appendix 2 (continued). June - July 1994 Downstream Migrant Fishway Traps

YOY DIURNAL TOTALS

Date	Number Captured			Number Mortality			Number Injuries			Number CWT			Time Fished		
	L.S. Fishway	H.S. Fishway	Total	L.S. Fishway	H.S. Fishway	Total	L.S. Fishway	H.S. Fishway	Total	L.S. Fishway	H.S. Fishway	Total	L.S. Fishway	H.S. Fishway	Total
06/20															
06/21	11		11	0		0	0		0	11		11	7.25		7.25
06/22			0			0			0			0			0.00
06/23	18	10	28	0	0	0	0	0	0	18	6	24	7.00	6.50	13.50
06/24	10	4	14	0	0	0	2	0	2	10	4	14	7.75	7.25	15.00
06/25	6	11	17	0	0	0	0	1	1	6	11	17	6.50	5.75	12.25
06/26	3	8	11	0	0	0	0	0	0	3	8	11	7.00	7.00	14.00
06/27	9	12	21	0	0	0	0	1	1	8	12	20	5.50	7.00	12.50
06/28	5	2	7	0	0	0	2	1	3	5	2	7	7.50	7.25	14.75
06/29	1	2	3	0	0	0	1	0	1	1	2	3	7.00	6.25	13.25
06/30	2	6	8	0	0	0	1	0	1	2	5	7	7.25	6.50	13.75
07/01	3	2	5	0	0	0	0	0	0	3	2	5	7.75	7.75	15.50
07/02	4	3	7	0	0	0	0	0	0	4	3	7	6.25	5.00	11.25
07/03	3	2	5	0	1	1	0	0	0	3	1	4	7.25	7.50	14.75
07/04	1	0	1	0	0	0	0	0	0	1	0	1	5.75	5.50	11.25
07/05	10	7	17	0	0	0	0	0	0	10	7	17	7.50	7.25	14.75
07/06	0	0	0	0	0	0	0	0	0	0	0	0	5.25	5.25	10.50
07/07	8	2	10	0	0	0	2	0	2	8	2	10	8.00	8.25	16.25
07/08	1	0	1	0	0	0	0	0	0	1	0	1	7.00	6.25	13.25
07/09	5	17	22	0	0	0	0	0	0	5	17	22	10.00	10.00	20.00
07/10	10	8	18	0	0	0	0	0	0	10	1	11	9.50	8.75	18.25
07/11	4	1	5	0	0	0	0	0	0	4	1	5	7.75	7.50	15.25
07/12	4	7	11	0	2	2	0	0	0	4	5	9	7.25	7.50	14.75
07/13	0	4	4	0	0	0	0	0	0	0	4	4	7.00	7.25	14.25
07/14	2	5	7	0	0	0	0	0	0	2	5	7	7.50	7.00	14.50
07/15	1	0	1	0	0	0	0	0	0	1	0	1	7.25	7.25	14.50
07/16	0	1	1	0	0	0	0	0	0	0	1	1	7.50	6.75	14.25
07/17	0	1	1	0	0	0	0	0	0	0	1	1	7.25	7.25	14.50
07/18	2	2	4	0	1	1	0	1	1	2	1	3	11.25	10.75	22.00
07/19	0	0	0	0	0	0	0	0	0	0	0	0	11.50	11.25	22.75
07/20	0	0	0	0	0	0	0	0	0	0	0	0	5.25	5.50	10.75
07/21	2	0	2	0	0	0	0	0	0	0	0	0	8.00	7.25	15.25
07/22	/1	0	0	0	0	0	0	0	0	0	0	0	/1	6.50	6.50
07/23	1	4	5	0	0	0	0	0	0	0	2	2	7.75	7.75	15.50
07/24	0	0	0	0	0	0	0	0	0	0	0	0	6.00	5.50	11.50
07/25	0	0	0	0	0	0	0	0	0	0	0	0	8.00	8.00	16.00
07/26	0	1	1	0	0	0	0	0	0	0	1	1	7.00	7.50	14.50
07/27	1	1	2	0	0	0	0	1	1	0	0	0	7.50	6.25	13.75
07/28	0	3	3	0	0	0	0	0	0	0	3	3	7.25	7.25	14.50
07/29	0	0	0	0	0	0	0	0	0	0	0	0	7.50	7.75	15.25
07/30	0	3	3	0	0	0	0	0	0	0	3	3	7.75	7.00	14.75
07/31	0	0	0	0	0	0	0	0	0	0	0	0	7.50	7.50	15.00
TOTALS	127	129	256	0	4	4	8	5	13	ERR	232	232	290.75	281.25	572.00

Notes: Low-stage fishway began operation on 6/21/94; high-stage fishway began operation on 6/23/94.
/1 Unable to tend fish bypass outfall trap in the low-stage fishway due to excessive spill in spill bay #1.

Appendix 2 (continued). June - July 1994 Downstream Migrant Fishway Traps
YOY DAILY TOTALS

Date	Grand Total Captured	Grand Total Mortality	Grand Total Injuries	Grand Total CWT	Total Timed Fished	Grand Total L.S. Fishway	Grand Total H.S. Fishway
06/20							
06/21	48	0	1	11	7.25	48	
06/22	67	0	3	61	22.00	67	
06/23	124	3	3	104	31.75	30	94
06/24	62	0	3	54	47.75	21	41
06/25	104	1	4	103	45.50	13	91
06/26	112	4	2	108	47.75	35	77
06/27	72	0	3	71	48.00	17	55
06/28	41	1	3	40	49.25	13	28
06/29	51	2	4	49	47.50	6	45
06/30	41	0	3	40	48.50	11	30
07/01	29	0	1	29	49.00	8	21
07/02	18	1	0	17	47.25	10	8
07/03	26	1	0	25	48.00	17	9
07/04	17	0	1	17	47.50	15	2
07/05	48	0	1	48	49.00	30	18
07/06	13	0	0	13	45.50	8	5
07/07	24	0	2	24	51.00	19	5
07/08	19	0	1	19	45.75	11	8
07/09	54	0	0	49	50.00	9	45
07/10	68	1	0	55	47.00	21	47
07/11	43	0	0	43	47.25	20	23
07/12	25	2	1	23	48.75	16	9
07/13	21	1	0	20	47.20	3	18
07/14	24	0	1	23	49.25	6	18
07/15	15	1	0	14	47.50	2	13
07/16	17	0	0	17	48.00	3	14
07/17	6	0	0	6	49.00	3	3
07/18	9	2	1	7	55.00	2	7
07/19	8	0	0	8	53.50	3	5
07/20	5	1	0	4	40.50	4	1
07/21	7	0	0	3	48.75	6	1
07/22	1	0	0	0	39.50	1	0
07/23	10	1	0	2	56.75	3	7
07/24	7	0	0	7	44.00	0	7
07/25	7	0	0	7	52.00	0	7
07/26	5	1	0	3	47.50	1	4
07/27	5	0	1	3	47.00	2	3
07/28	7	1	0	6	47.25	0	7
07/29	2	0	0	2	48.75	2	0
07/30	7	0	1	7	47.25	1	6
07/31	1	1	0	0	48.25	0	1
TOTALS	1270	25	40	1142	1888.20	487	783

Notes: Low-stage fishway began operation on 6/21/94; high-stage fishway began operation on 6/23/94.

Appendix 3. Estimated Daily Abundance of Downstream Migrant Salmon - Jan-July 1994
Woodbridge Dam - Mokelumne River, CA

Note: Differences in totals may be attributable to rounding

DATE	YOY# DAY	YOY # NIGHT	TRAPEFF DAY	TRAPEFF NIGHT	EST#YOY DAY	EST#YOY NIGHT	EST#YOY TOTAL
01/01	0	0					
01/02	0	0					
01/03	0	0					
01/04	0	0					
01/05	0	0					
01/06	0	0					
01/07	0	0					
01/08	0	0					
01/09	0	0					
01/10	0	0					
01/11	0	0					
01/12	0	0					
01/13	0	0					
01/14	0	0					
01/15	0	0	0.179	0.278	0	0	0
01/16	0	0	0.179	0.278	0	0	0
01/17	0	0	0.179	0.278	0	0	0
01/18	0	0	0.179	0.278	0	0	0
01/19	0	0	0.179	0.278	0	0	0
01/20	0	0	0.179	0.278	0	0	0
01/21	0	0	0.179	0.278	0	0	0
01/22	0	0	0.179	0.278	0	0	0
01/23	0	0	0.179	0.278	0	0	0
01/24	0	0	0.179	0.278	0	0	0
01/25	0	0	0.179	0.278	0	0	0
01/26	0	0	0.179	0.278	0	0	0
01/27	0	0	0.179	0.278	0	0	0
01/28	0	0	0.179	0.278	0	0	0
01/29	0	0	0.179	0.278	0	0	0
01/30	0	1	0.179	0.278	0	4	4
01/31	4	0	0.179	0.278	22	0	22
02/01	0	2	0.179	0.278	0	7	7
02/02	0	0	0.179	0.278	0	0	0
02/03	0	0	0.179	0.278	0	0	0
02/04	0	4	0.179	0.278	0	14	14
02/05	0	0	0.179	0.278	0	0	0
02/06	0	0	0.179	0.278	0	0	0
02/07	0	0	0.179	0.278	0	0	0
02/08	1	1	0.179	0.278	6	4	9

Appendix 3. Estimated Daily Abundance of Downstream Migrant Salmon - Jan-July 1994
Woodbridge Dam - Mokelumne River, CA

Note: Differences in totals may be attributable to rounding

DATE	YOY# DAY	YOY # NIGHT	TRAPEFF DAY	TRAPEFF NIGHT	EST#YOY DAY	EST#YOY NIGHT	EST#YOY TOTAL
02/09	0	1	0.179	0.278	0	4	4
02/10	4	0	0.179	0.278	22	0	22
02/11	2	3	0.179	0.278	11	11	22
02/12	3	10	0.179	0.278	17	36	53
02/13	0	5	0.179	0.278	0	18	18
02/14	1	16	0.179	0.278	6	58	63
02/15	1	13	0.179	0.278	6	47	52
02/16	2	6	0.179	0.278	11	22	33
02/17	5	1	0.179	0.278	28	4	32
02/18	2	1	0.179	0.278	11	4	15
02/19	0	0	0.179	0.278	0	0	0
02/20	0	3	0.179	0.278	0	11	11
02/21	0	1	0.179	0.278	0	4	4
02/22	0	0	0.179	0.278	0	0	0
02/23	2	3	0.179	0.278	11	11	22
02/24	0	7	0.179	0.278	0	25	25
02/25	1	1	0.179	0.278	6	4	9
02/26	0	0	0.179	0.278	0	0	0
02/27	0	3	0.179	0.278	0	11	11
02/28	0	1	0.179	0.278	0	4	4
03/01	2	1	0.179	0.278	11	4	15
03/02	0	2	0.179	0.278	0	7	7
03/03	0	1	0.179	0.278	0	4	4
03/04	0	1	0.179	0.278	0	4	4
03/05	0	2	0.179	0.278	0	7	7
03/06	0	0	0.179	0.278	0	0	0
03/07	0	0	0.179	0.278	0	0	0
03/08	0	2	0.179	0.278	0	7	7
03/09	0	0	0.141	0.043	0	0	0
03/10	0	0	0.141	0.043	0	0	0
03/11	0	0	0.141	0.043	0	0	0
03/12	0	0	0.141	0.043	0	0	0
03/13	0	0	0.141	0.043	0	0	0
03/14	0	0	0.088	0.027	0	0	0
03/15	0	0	0.088	0.027	0	0	0
03/16	0	0	0.088	0.027	0	0	0
03/17	1	0	0.088	0.027	11	0	11
03/18	0	0	0.088	0.027	0	0	0
03/19	0	1	0.088	0.027	0	37	37

Appendix 3. Estimated Daily Abundance of Downstream Migrant Salmon - Jan-July 1994 Woodbridge Dam - Mokelumne River, CA

Note: Differences in totals may be attributable to rounding

DATE	YOY# DAY	YOY # NIGHT	TRAPEFF DAY	TRAPEFF NIGHT	EST#YOY DAY	EST#YOY NIGHT	EST#YOY TOTAL
03/20	0	0	0.088	0.027	0	0	0
03/21	0	0	0.088	0.027	0	0	0
03/22	0	0	0.088	0.027	0	0	0
03/23	0	0	0.088	0.027	0	0	0
03/24	0	0	0.163	0.295	0	0	0
03/25	0	0	0.163	0.295	0	0	0
03/26	0	0	0.163	0.295	0	0	0
03/27	0	0	0.163	0.295	0	0	0
03/28	0	0	0.163	0.295	0	0	0
03/29	0	0	0.163	0.295	0	0	0
03/30	1	0	0.163	0.295	6	0	6
03/31	0	0	0.063	0.236	0	0	0
04/01	1	0	0.063	0.236	16	0	16
04/02	0	0	0.063	0.236	0	0	0
04/03	0	0	0.063	0.236	0	0	0
04/04	0	1	0.063	0.236	0	4	4
04/05	0	2	0.063	0.236	0	8	8
04/06	0	5	0.063	0.236	0	21	21
04/07	0	14	0.063	0.236	0	59	59
04/08	0	7	0.063	0.236	0	30	30
04/09	0	7	0.063	0.236	0	30	30
04/10	0	43	0.063	0.236	0	182	182
04/11	0	68	0.063	0.236	0	288	288
04/12	2	15	0.063	0.236	32	64	95
04/13	3	49	0.063	0.236	48	208	255
04/14	1	53	0.063	0.236	16	225	240
04/15	3	48	0.063	0.236	48	203	251
04/16	0	24	0.063	0.236	0	102	102
04/17	0	63	0.063	0.236	0	267	267
04/18	0	95	0.063	0.236	0	403	403
04/19	17	97	0.063	0.271	270	358	628
04/20	26	546	0.063	0.271	413	2015	2427
04/21	11	199	0.063	0.271	175	734	909
04/22	9	224	0.063	0.271	143	827	969
04/23	6	127	0.063	0.271	95	469	564
04/24	5	77	0.063	0.271	79	284	363
04/25	0	144	0.063	0.271	0	531	531
04/26	14	341	0.063	0.271	222	1258	1481
04/27	26	478	0.063	0.271	413	1764	2177

Appendix 3. Estimated Daily Abundance of Downstream Migrant Salmon - Jan-July 1994
Woodbridge Dam - Mokelumne River, CA

Note: Differences in totals may be attributable to rounding

DATE	YOY# DAY	YOY # NIGHT	TRAPEFF DAY	TRAPEFF NIGHT	EST#YOY DAY	EST#YOY NIGHT	EST#YOY TOTAL
04/28	5	219	0.071	0.234	70	936	1006
04/29	10	249	0.071	0.234	141	1064	1205
04/30	10	68	0.071	0.234	141	291	431
05/01	3	103	0.071	0.234	42	440	482
05/02	0	108	0.071	0.234	0	462	462
05/03	5	197	0.071	0.234	70	842	912
05/04	26	132	0.071	0.234	366	564	930
05/05	8	222	0.071	0.234	113	949	1061
05/06	5	77	0.071	0.234	70	329	399
05/07	45	199	0.071	0.234	634	850	1484
05/08	12	491	0.071	0.234	169	2098	2267
05/09	13	359	0.071	0.234	183	1534	1717
05/10	50	67	0.071	0.234	704	286	991
05/11	14	227	0.071	0.234	197	970	1167
05/12	2	294	0.071	0.234	28	1256	1285
05/13	27	50	0.071	0.234	380	214	594
05/14	16	22	0.071	0.234	225	94	319
05/15	7	173	0.071	0.234	99	739	838
05/16	0	86	0.071	0.234	0	368	368
05/17	0	8	0.004	0.010	0	800	800
05/18	41	78	0.004	0.010	10250	7800	18050
05/19	2	17	0.004	0.010	500	1700	2200
05/20	114	76	0.004	0.010	28500	7600	36100
05/21	45	42	0.004	0.010	11250	4200	15450
05/22	21	91	0.004	0.010	5250	9100	14350
05/23	6	44	0.004	0.010	1500	4400	5900
05/24	9	20	0.004	0.010	2250	2000	4250
05/25	2	74	0.004	0.010	500	7400	7900
05/26	7	19	0.024	0.226	292	84	376
05/27	11	41	0.024	0.226	458	181	640
05/28	0	17	0.024	0.226	0	75	75
05/29	1	10	0.024	0.226	42	44	86
05/30	0	21	0.024	0.226	0	93	93
05/31	10	1	0.024	0.226	417	4	421
06/01	/3	12	0.024	0.226	0	53	53
06/02	2	34	0.024	0.226	83	150	234
06/03	5	23	0.024	0.226	208	102	310
06/04	10	15	0.024	0.226	417	66	483
06/05	0	9	0.024	0.226	0	40	40

Appendix 3. Estimated Daily Abundance of Downstream Migrant Salmon - Jan-July 1994
Woodbridge Dam - Mokelumne River, CA

Note: Differences in totals may be attributable to rounding

DATE	YOY# DAY	YOY # NIGHT	TRAPEFF DAY	TRAPEFF NIGHT	EST#YOY DAY	EST#YOY NIGHT	EST#YOY TOTAL
06/06	0	4	0.024	0.226	0	18	18
06/07	0	1	0.024	0.226	0	4	4
06/08	8	3	0.024	0.226	333	13	347
06/09	5	20	0.024	0.226	208	88	297
06/10	12	29	0.024	0.226	500	128	628
06/11	3	15	0.024	0.226	125	66	191
06/12	0	2	0.024	0.226	0	9	9
06/13	0	1	0.024	0.226	0	4	4
06/14	21	19	0.024	0.226	875	84	959
06/15	10	12	0.024	0.226	417	53	470
06/16	3	10	0.024	0.226	125	44	169
06/17	1	10	0.024	0.226	42	44	86
06/18	1	5	0.024	0.226	42	22	64
06/19	0	9	0.024	0.226	0	40	40
06/20	0	17	0.024	0.226	0	75	75
06/21	12	42	1.000	1.000	12	42	54
06/22		69	1.000	1.000	0	69	69
06/23	28	96	1.000	1.000	28	96	124
06/24	14	48	1.000	1.000	14	48	62
06/25	17	87	1.000	1.000	17	87	104
06/26	11	101	1.000	1.000	11	101	112
06/27	21	51	1.000	1.000	21	51	72
06/28	7	34	1.000	1.000	7	34	41
06/29	3	48	1.000	1.000	3	48	51
06/30	8	33	1.000	1.000	8	33	41
07/01	5	24	1.000	1.000	5	24	29
07/02	7	11	1.000	1.000	7	11	18
07/03	5	21	1.000	1.000	5	21	26
07/04	1	16	1.000	1.000	1	16	17
07/05	17	31	1.000	1.000	17	31	48
07/06	0	13	1.000	1.000	0	13	13
07/07	10	14	1.000	1.000	10	14	24
07/08	1	18	1.000	1.000	1	18	19
07/09	22	32	1.000	1.000	22	32	54
07/10	18	50	1.000	1.000	18	50	68
07/11	5	38	1.000	1.000	5	38	43
07/12	11	14	1.000	1.000	11	14	25
07/13	4	17	1.000	1.000	4	17	21
07/14	7	17	1.000	1.000	7	17	24

Appendix 3. Estimated Daily Abundance of Downstream Migrant Salmon - Jan-July 1994
Woodbridge Dam - Mokelumne River, CA

Note: Differences in totals may be attributable to rounding

DATE	YOY# DAY	YOY # NIGHT	TRAPEFF DAY	TRAPEFF NIGHT	EST#YOY DAY	EST#YOY NIGHT	EST#YOY TOTAL
07/15	1	14	1.000	1.000	1	14	15
07/16	1	16	1.000	1.000	1	16	17
07/17	1	5	1.000	1.000	1	5	6
07/18	4	5	1.000	1.000	4	5	9
07/19	0	8	1.000	1.000	0	8	8
07/20	0	5	1.000	1.000	0	5	5
07/21	2	5	1.000	1.000	2	5	7
07/22	0	1	1.000	1.000	0	1	1
07/23	5	5	1.000	1.000	5	5	10
07/24	0	7	1.000	1.000	0	7	7
07/25	0	7	1.000	1.000	0	7	7
07/26	1	4	1.000	1.000	1	4	5
07/27	2	3	1.000	1.000	2	3	5
07/28	3	4	1.000	1.000	3	4	7
07/29	0	2	1.000	1.000	0	2	2
07/30	3	4	1.000	1.000	3	4	7
07/31	0	1	1.000	1.000	0	1	1
TOTAL:	**1021**	**7993**			**70627**	**72597**	**143224**

DATE	AVGTL (mm)	AVGFL (mm)	AVGWT (g)	AVGK	STDTL	STDFL	STDWT	STDK	MAXTL (mm)	MINTL (mm)	MAXWT (g)	MINWT (g)	N
01/01/94													0
01/02/94													0
01/03/94													0
01/04/94													0
01/05/94													0
01/06/94													0
01/07/94													0
01/08/94													0
01/09/94													0
01/10/94													0
01/11/94													0
01/12/94													0
01/13/94													0
01/14/94													0
01/15/94													0
01/16/94													0
01/17/94													0
01/18/94													0
01/19/94													0
01/20/94													0
01/21/94													0
01/22/94													0
01/23/94													0
01/24/94													0
01/25/94													0
01/26/94													0
01/27/94													0
01/28/94													0
01/29/94													0
01/30/94													0
01/31/94													0
02/01/94	32	30	0.3	8.09E-04	0.7	0.7	0.07	2.83E-04	32	31	0.3	0.2	2
02/02/94													0
02/03/94													0
02/04/94	31	30	0.1	4.22E-04	1.0	0.6	0.06	1.50E-04	32	30	0.2	0.1	4
02/05/94													0
02/06/94													0
02/07/94													0
02/08/94	38	37	0.2	3.95E-04	0.7	0.7	0.00	0.00E+00	38	37	0.2	0.2	2
02/09/94	41	39			0.0	0.0			41	41			1
02/10/94	40	38	0.3	4.44E-04	2.5	2.5	0.06	4.27E-05	42	36	0.3	0.2	4
02/11/94	35	34	0.3	6.64E-04	3.4	2.9	0.05	2.53E-04	39	30	0.3	0.2	5
02/12/94	39	38	0.3	5.35E-04	4.3	3.7	0.27	1.35E-04	53	31	1.2	0.2	13
02/13/94	37	36	0.2	3.83E-04	0.6	0.6	0.00	1.89E-05	38	37	0.2	0.2	5
02/14/94	39	37	0.3	4.43E-04	4.4	3.9	0.25	1.54E-04	54	34	1.2	0.1	17
02/15/94	38	37	0.3	4.68E-04	5.6	5.4	0.21	9.77E-05	51	28	0.8	0.1	13
02/16/94	39	38	0.3	5.52E-04	2.2	1.7	0.13	1.47E-04	43	36	0.6	0.2	8
02/17/94	38	37	0.3	4.54E-04	0.9	0.9	0.04	7.57E-05	40	36	0.4	0.2	6
02/18/94	38	37	0.3	6.03E-04	4.2	4.2	0.00	1.87E-04	41	35	0.4	0.3	3
02/19/94													0
02/20/94	31	30	0.1	3.40E-04	2.4	2.4	0.00	8.56E-05	32	29	0.1	0.1	3
02/21/94	38	37	0.3	5.47E-04	0.0	0.0	0.00	0.00E+00	38	38	0.3	0.3	1
02/22/94													0
02/23/94	38	37	0.3	5.38E-04	1.1	1.6	0.00	4.79E-05	39	37	0.3	0.3	4
02/24/94	40	39	0.4	5.13E-04	7.0	6.9	0.33	1.18E-04	54	35	1.0	0.2	7
02/25/94	34	32	0.3	8.68E-04	7.1	7.1	0.00	5.12E-04	39	29	0.3	0.3	2
02/26/94													0
02/27/94	32	31	0.2	4.85E-04	2.1	2.1	0.07	1.22E-04	34	31	0.2	0.1	3
02/28/94	38	37	0.2	3.64E-04	0.0	0.0	0.00	0.00E+00	38	38	0.2	0.2	1
03/01/94	37	36	0.3	5.26E-04	2.1	1.4	0.00	9.71E-05	39	36	0.3	0.2	3
03/02/94	37	36	0.3	5.95E-04	1.4	1.4	0.00	6.81E-05	38	36	0.3	0.3	2
03/03/94	36	35	0.2	4.29E-04	0.0	0.0	0.00	0.00E+00	36	36	0.2	0.2	1
03/04/94	35	34	0.2	4.66E-04	0.0	0.0	0.00	0.00E+00	35	35	0.2	0.2	1
03/05/94	38	36	0.3	4.67E-04	2.1	2.1	0.01	5.45E-05	39	36	0.3	0.2	2
03/06/94													0
03/07/94													0
03/08/94	40	39	0.3	4.71E-04	1.4	0.7	0.00	4.98E-05	41	39	0.3	0.3	2
03/09/94													0
03/10/94													0
03/11/94													0
03/12/94													0
03/13/94													0
03/14/94													0
03/15/94													0
03/16/94													0
03/17/94	42	40	0.5	6.75E-04	0.0	0.0	0.00	0.00E+00	42	42	0.5	0.5	1

Appendix 4. **Size and Condition Database - January to July 1994** **Y-O-Y Chinook Salmon** **Woodbridge Dam**

DATE	AVGTL (mm)	AVGFL (mm)	AVGWT (g)	AVGK	STDTL	STDFL	STDWT	STDK	MAXTL (mm)	MINTL (mm)	MAXWT (g)	MINWT (g)	N
03/18/94													0
03/19/94	39	37	0.2	3.37E-04	0.0	0.0	0.00	0.00E+00	39	39	0.2	0.2	1
03/20/94													0
03/21/94													0
03/22/94													0
03/23/94													0
03/24/94													0
03/25/94													0
03/26/94													0
03/27/94													0
03/28/94													0
03/29/94													0
03/30/94	36	34	0.2	4.29E-04	0.0	0.0	0.00	0.00E+00	36	36	0.2	0.2	1
03/31/94													0
04/01/94	40	38	0.3	4.69E-04	0.0	0.0	0.00	0.00E+00	40	40	0.3	0.3	1
04/02/94													0
04/03/94													0
04/04/94	76	68	3.4	7.75E-04	0.0	0.0	0.00	0.00E+00	76	76	3.4	3.4	1
04/05/94	96	87	6.8	7.79E-04	3.5	4.2	0.85	1.09E-05	98	93	7.4	6.2	2
04/06/94	88	80	5.4	7.85E-04	8.9	8.4	1.60	3.22E-05	95	76	6.9	3.5	5
04/07/94	92	85	6.2	7.71E-04	9.3	8.2	1.74	6.18E-05	108	72	9.0	3.3	14
04/08/94	89	80	5.3	7.57E-04	6.0	5.3	1.09	7.39E-05	95	80	6.5	3.7	7
04/09/94	91	83	5.8	7.61E-04	6.5	5.9	1.40	3.74E-05	97	82	7.4	3.9	7
04/10/94	91	83	6.1	7.97E-04	5.4	5.1	0.97	5.57E-05	103	81	8.2	4.8	30
04/11/94	92	83	6.0	7.66E-04	5.8	5.2	1.20	4.06E-05	106	83	8.9	4.3	30
04/12/94	88	81	4.8	7.81E-04	7.8	7.5	1.15	5.08E-05	105	72	6.1	2.7	17
04/13/94	91	83	5.8	7.60E-04	8.2	7.5	1.59	5.15E-05	108	72	9.8	3.4	32
04/14/94	91	83	5.9	7.72E-04	7.3	6.1	1.29	5.09E-05	112	80	8.8	4.1	31
04/15/94	91	83	5.8	7.52E-04	8.5	7.3	1.56	4.04E-05	111	72	10.9	2.8	33
04/16/94	91	83	5.7	7.47E-04	6.5	5.4	1.19	3.56E-05	102	78	8.5	3.8	24
04/17/94	92	84	6.4	8.04E-04	7.9	7.1	2.00	5.94E-05	113	79	12.4	3.8	30
04/18/94	91	83	5.9	7.67E-04	6.1	5.4	1.29	5.69E-05	106	83	9.0	4.1	30
04/19/94	91	83	5.9	7.64E-04	7.8	6.8	1.29	5.84E-05	105	63	8.2	2.3	46
04/20/94	90	82	5.9	7.94E-04	7.8	6.9	1.58	5.33E-05	112	70	11.6	2.8	55
04/21/94	91	83	5.9	7.59E-04	6.6	6.0	1.25	4.26E-05	106	77	8.6	3.6	41
04/22/94	94	85	6.2	7.45E-04	7.5	6.8	1.53	4.14E-05	107	74	0.0	2.9	39
04/23/94	92	84	6.0	7.61E-04	6.6	6.3	1.38	5.27E-05	107	76	9.4	3.2	36
04/24/94	91	83	6.1	8.00E-04	7.4	6.7	1.39	5.43E-05	107	71	9.2	3.0	35
04/25/94	91	83	6.0	7.93E-04	6.8	6.2	1.28	6.03E-05	100	77	7.6	3.2	30
04/26/94	91	83	6.0	7.78E-04	6.2	5.7	1.30	8.47E-05	111	79	10.9	3.7	44
04/27/94	92	84	6.2	7.69E-04	7.0	6.3	1.41	5.41E-05	107	76	9.4	3.5	55
04/28/94	90	82	6.0	7.95E-04	8.5	7.7	1.58	5.96E-05	106	72	9.4	2.7	35
04/29/94	91	83	5.8	7.61E-04	5.3	4.6	1.12	3.93E-05	103	82	8.8	4.0	40
04/30/94	91	83	5.9	7.59E-04	7.4	6.6	1.60	5.75E-05	108	79	10.2	3.5	40
05/01/94	92	84	6.1	7.65E-04	4.2	3.8	0.96	4.32E-05	100	85	8.0	4.6	33
05/02/94	93	85	6.4	7.85E-04	6.3	5.7	1.40	7.92E-05	109	81	10.7	3.8	30
05/03/94	90	81	5.6	7.61E-04	6.1	5.7	1.34	4.28E-05	110	82	10.3	3.9	35
05/04/94	93	84	6.3	7.77E-04	6.8	6.2	1.36	4.39E-05	109	79	9.8	3.8	55
05/05/94	95	87	6.8	7.81E-04	6.2	5.6	1.48	5.54E-05	106	78	10.5	3.6	36
05/06/94	93	84	6.2	7.69E-04	7.5	6.7	1.53	4.73E-05	106	75	9.1	3.1	35
05/07/94	94	86	6.7	7.83E-04	7.9	7.2	1.78	4.37E-05	115	75	12.0	3.2	60
05/08/94	96	87	7.0	7.84E-04	7.4	6.5	1.68	5.58E-05	115	81	11.3	4.1	42
05/09/94	96	87	6.9	7.74E-04	6.6	6.3	1.57	5.03E-05	108	79	10.4	3.8	43
05/10/94	94	85	6.4	7.72E-04	6.9	6.3	1.59	4.56E-05	123	79	13.6	3.4	60
05/11/94													0
05/12/94													0
05/13/94	93	85	6.4	7.78E-04	5.6	5.1	1.15	3.81E-05	107	76	9.3	3.5	57
05/14/94	93	84	6.4	8.00E-04	6.5	6.0	1.44	4.32E-05	109	82	10.4	4.3	38
05/15/94	92	84	6.4	8.02E-04	6.3	5.9	1.51	4.52E-05	107	81	11.1	4.2	37
05/16/94	96	87	7.4	8.22E-04	6.9	5.8	1.55	6.72E-05	112	86	10.1	4.9	30
05/17/94	90	82	5.9	7.91E-04	6.9	6.4	1.27	4.04E-05	97	80	7.1	4.2	7
05/18/94	96	88	7.3	8.07E-04	7.1	6.3	1.76	4.35E-05	112	80	11.9	3.9	60
05/19/94	93	84	6.6	8.03E-04	6.2	5.6	1.40	7.35E-05	105	77	9.2	3.7	19
05/20/94	96	87	7.1	7.98E-04	7.2	6.5	1.70	4.11E-05	110	80	10.8	3.8	53
05/21/94	94	85	6.7	7.90E-04	9.3	8.5	1.95	5.12E-05	117	68	12.6	2.6	60
05/22/94	95	86	7.1	8.00E-04	8.3	7.6	1.98	5.56E-05	114	78	11.7	3.6	51
05/23/94	98	89	7.6	8.02E-04	8.9	7.7	2.04	4.36E-05	114	81	12.1	4.5	30
05/24/94	97	88	7.3	7.94E-04	7.4	6.8	1.79	4.39E-05	116	78	12.1	3.6	46
05/25/94	97	88	7.4	7.96E-04	7.9	7.0	1.83	7.12E-05	115	83	12.4	4.5	60
05/26/94	100	91	8.0	7.86E-04	7.2	6.8	1.62	3.68E-05	114	88	11.4	5.1	24
05/27/94	99	90	7.7	7.89E-04	7.1	6.5	1.65	4.61E-05	118	86	13.8	5.4	40
05/28/94	94	86	6.8	8.02E-04	7.8	7.5	1.79	4.35E-05	114	85	11.7	4.9	17
05/29/94	97	88	7.3	7.87E-04	8.8	8.2	2.28	5.50E-05	110	87	11.3	4.8	9
05/30/94	100	91	8.1	8.00E-04	8.6	7.8	2.02	5.43E-05	117	86	11.8	4.8	20
05/31/94	102	92	8.2	7.68E-04	6.3	5.2	1.60	4.72E-05	110	91	10.3	5.6	11
06/01/94	102	92	8.5	7.89E-04	6.9	6.3	1.78	4.99E-05	109	88	10.2	5.5	12

Appendix 4. Size and Condition Database - January to July 1994 Y-O-Y Chinook Salmon Woodbridge Dam

DATE	AVGTL (mm)	AVGFL (mm)	AVGWT (g)	AVGK	STDTL	STDFL	STDWT	STDK	MAXTL (mm)	MINTL (mm)	MAXWT (g)	MINWT (g)	N
06/02/94	96	88	7.4	8.05E-04	11.5	10.2	2.61	4.90E-05	122	75	14.6	3.6	32
06/03/94	101	92	8.2	7.72E-04	7.2	6.5	1.97	4.41E-05	115	87	12.7	4.8	27
06/04/94	102	93	8.8	8.07E-04	8.6	8.0	2.40	6.51E-05	121	88	16.2	5.2	25
06/05/94	97	89	7.9	8.52E-04	6.4	5.5	1.38	6.51E-05	108	90	9.9	6.5	9
06/06/94	109	99	9.8	7.67E-04	7.1	6.6	1.23	8.38E-05	115	101	11.0	8.9	4
06/07/94	90	81	6.2	8.50E-04	0.0	0.0	0.00	0.00E+00	90	90	6.2	6.2	1
06/08/94	105	96	9.7	8.19E-04	9.5	9.2	3.06	5.01E-05	122	94	16.4	6.5	10
06/09/94	103	95	9.1	8.05E-04	9.1	8.5	2.46	7.27E-05	124	87	15.6	5.9	25
06/10/94	102	93	8.7	7.94E-04	9.9	8.9	2.52	5.25E-05	120	85	15.3	5.0	37
06/11/94	106	96	9.7	8.16E-04	7.8	7.5	2.16	6.61E-05	116	90	13.0	5.0	17
06/12/94	108	99	11.0	8.61E-04	12.7	11.3	3.39	3.51E-05	117	99	13.4	8.6	2
06/13/94	94	86	6.6	7.95E-04	0.0	0.0	0.00	0.00E+00	94	94	6.6	6.6	1
06/14/94	106	96	9.5	7.93E-04	7.7	7.2	2.21	5.37E-05	125	94	15.8	6.1	37
06/15/94	106	96	9.6	7.87E-04	10.0	9.6	3.48	7.44E-05	130	93	18.9	5.4	22
06/16/94	104	94	9.3	8.19E-04	10.2	9.4	3.06	3.75E-05	124	91	15.8	5.8	13
06/17/94	100	91	7.9	7.86E-04	5.7	5.0	1.47	6.31E-05	107	89	10.4	5.7	11
06/18/94	109	100	10.8	8.03E-04	14.5	12.7	5.02	4.15E-05	130	90	19.0	5.6	6
06/19/94	102	92	8.7	8.03E-04	12.2	11.1	3.51	8.64E-05	127	86	15.8	5.4	9
06/20/94	103	94	9.3	8.15E-04	13.0	11.7	3.78	3.04E-05	130	81	18.8	4.1	17
06/21/94	108	98	10.8	8.31E-04	8.9	7.7	2.88	5.27E-05	127	89	17.8	5.4	47
06/22/94	112	102	12.0	8.55E-04	8.5	7.9	2.64	8.74E-05	127	91	17.2	6.3	32
06/23/94	110	101	11.1	8.04E-04	10.7	9.8	3.30	5.51E-05	140	74	22.7	3.9	70
06/24/94	111	101	11.6	8.33E-04	9.1	8.3	3.10	5.63E-05	139	87	23.5	4.8	55
06/25/94	106	97	9.9	8.18E-04	7.7	7.1	2.42	6.25E-05	128	82	18.3	4.3	53
06/26/94	107	98	10.2	8.22E-04	8.6	7.9	2.53	6.00E-05	133	87	19.5	5.6	71
06/27/94	109	100	10.8	8.12E-04	9.6	8.8	3.14	5.42E-05	133	87	19.6	5.0	59
06/28/94	108	98	10.1	7.95E-04	8.1	7.4	2.30	5.02E-05	122	89	15.0	5.2	40
06/29/94	108	99	10.5	8.10E-04	8.4	7.5	2.61	7.96E-05	124	93	15.3	6.5	38
06/30/94	110	100	10.9	8.07E-04	10.4	9.5	3.28	4.13E-05	135	95	20.9	6.6	41
07/01/94	109	99	10.5	7.90E-04	6.9	6.1	2.15	4.29E-05	122	98	15.7	7.3	29
07/02/94	108	98	10.5	7.89E-04	12.2	10.9	4.13	4.08E-05	140	90	22.4	5.7	17
07/03/94	112	102	11.6	7.93E-04	13.2	12.1	4.37	4.05E-05	149	85	24.1	5.3	25
07/04/94	110	100	10.9	8.00E-04	11.2	10.4	3.87	6.16E-05	138	93	22.0	6.5	17
07/05/94	109	99	11.3	7.84E-04	8.4	8.5	2.81	4.86E-05	133	92	20.0	6.9	48
07/06/94	109	99	10.5	7.99E-04	9.1	8.3	2.61	2.53E-05	124	97	15.1	6.9	13
07/07/94	111	101	11.3	8.03E-04	8.6	8.2	2.86	6.50E-05	135	95	20.0	6.9	24
07/08/94	115	105	12.8	8.04E-04	14.6	13.7	5.61	5.78E-05	144	96	25.3	6.5	19
07/09/94	111	101	11.2	8.06E-04	11.1	11.4	2.95	6.81E-05	135	92	18.0	7.0	29
07/10/94	112	102	11.3	7.81E-04	10.4	9.6	3.79	1.26E-04	142	100	23.2	2.0	32
07/11/94	115	104	12.4	8.04E-04	9.3	8.5	3.31	5.76E-05	141	95	23.6	6.6	43
07/12/94	117	107	13.8	8.17E-04	11.2	10.4	3.92	4.22E-05	136	99	20.5	7.5	23
07/13/94	116	106	13.0	8.02E-04	14.3	12.5	4.82	4.54E-05	141	85	23.7	5.2	20
07/14/94	117	107	13.1	7.91E-04	11.9	11.3	5.21	6.22E-05	143	100	27.0	7.4	24
07/15/94	111	101	11.1	7.87E-04	9.9	6.9	2.84	3.45E-05	127	94	16.2	6.2	14
07/16/94	121	109	14.0	7.80E-04	9.8	9.3	3.36	4.42E-05	138	103	19.4	8.4	17
07/17/94	108	99	10.6	8.11E-04	12.3	10.9	3.92	3.26E-05	122	93	15.9	6.4	6
07/18/94	108	99	10.1	7.43E-04	12.0	13.7	5.67	1.00E-04	127	91	18.3	5.2	7
07/19/94	120	113			10.2	7.6			133	100			13
07/20/94	110	99	10.4	7.71E-04	11.6	11.1	3.78	5.58E-05	119	97	14.1	6.7	4
07/21/94	112	101	11.1	7.67E-04	14.2	12.1	4.25	6.16E-05	133	95	17.1	6.8	7
07/22/94	137	124	20.3	7.89E-04	0.0	0.0	0.00	0.00E+00	137	137	20.3	20.3	1
07/23/94	127	115	18.5	8.60E-04	21.9	18.4	10.11	4.80E-05	142	111	25.6	11.3	2
07/24/94	116	106	13.0	7.87E-04	16.3	15.7	6.20	5.91E-05	141	101	23.3	8.2	7
07/25/94	119	108	13.3	7.85E-04	9.8	8.5	3.44	6.61E-05	127	103	17.2	8.1	7
07/26/94	117	106	13.3	7.81E-04	17.2	15.2	5.36	4.88E-05	133	93	19.6	5.7	4
07/27/94	125	114	16.6	8.49E-04	10.2	9.0	4.06	7.59E-05	140	118	23.0	12.0	5
07/28/94	117	106	12.6	7.74E-04	14.7	13.1	4.28	3.68E-05	133	94	18.1	6.4	6
07/29/94	128	117	16.9	8.10E-04	6.4	3.5	3.11	2.86E-05	132	123	19.1	14.7	2
07/30/94	120	109	14.0	7.74E-04	14.3	12.5	5.55	6.72E-05	136	96	22.0	6.4	7
07/31/94													0

Appendix 5. Size and Condition Database - October 1993 to July 1994 — Yearling Chinook Salmon — Woodbridge Dam

DATE	AVGTL (mm)	AVGFL (mm)	AVGWT (g)	AVGK	STDTL	STDFL	STDWT	STDK	MAXTL (mm)	MINTL (mm)	MAXWT (g)	MINWT (g)	N
10/01													
10/02													
10/03													
10/04													
10/05													
10/06													
10/07													
10/08													
10/09													
10/10													
10/11													
10/12													
10/13													
10/14													
10/15													
10/16													
10/17													
10/18													
10/19													
10/20													
10/21	143	133			26.9	25.8			198	80			31
10/22	148	138			27.0	26.4			219	102			58
10/23	153	143			23.1	22.9			195	109			36
10/24	162	151			19.9	19.5			205	110			54
10/25	162	151			18.8	18.3			197	112			72
10/26	145	135			0.0	0.0			145	145			1
10/27	152	141			19.2	18.4			197	120			57
10/28	156	145			21.9	20.8			195	122			36
10/29	143	131			17.9	16.4			175	95			40
10/30	144	133			21.6	21.1			190	111			55
10/31	152	139			20.1	19.1			192	124			23
11/01	153	141			29.6	28.0			215	112			21
11/02													
11/03	161	149			17.6	16.7			190	111			33
11/04	161	149			23.8	22.8			196	98			61
11/05	162	149			19.4	18.4			196	120			69
11/06	159	146			21.0	19.7			199	109			71
11/07	153	141			18.7	17.5			189	105			54
11/08	149	137			18.3	17.8			191	111			63
11/09	152	139			18.4	17.4			185	105			79
11/10	162	149			17.5	16.7			193	112			73
11/11	174	160			15.0	14.1			205	125			61
11/12	164	152			16.9	15.9			197	118			68
11/13	163	150			16.5	16.0			199	123			56
11/14	154	140			18.4	18.0			200	119			64
11/15	152	140			15.9	15.4			187	120			34
11/16	148	136			20.6	19.5			195	77			60
11/17	160	148			18.1	17.3			193	113			47
11/18	163	150			23.4	22.5			205	100			63
11/19	161	148			26.0	24.8			195	105			40
11/20	158	146			18.6	18.2			185	109			47
11/21	157	144			20.9	19.8			191	104			35
11/22	145	133			19.3	18.2			189	106			43
11/23	173	159			15.5	14.9			197	124			61
11/24	163	150			21.9	20.6			195	121			35
11/25	149	139			18.1	16.0			185	113			26
11/26	154	142			20.4	19.2			189	98			62
11/27	158	145			17.2	16.7			193	115			61
11/28	160	148			18.4	17.5			200	107			59
11/29	171	158			16.7	15.8			215	123			91
11/30	159	147			21.1	20.3			199	101			84
12/01	169	155			19.7	18.9			211	117			59
12/02	167	153			19.0	17.9			202	128			34
12/03	169	155			15.0	15.1			205	132			32
12/04	169	155			21.0	19.9			218	109			43
12/05	169	154			20.5	20.0			215	120			25
12/06	161	148			24.3	22.4			208	123			15
12/07	160	147			26.6	24.6			203	125			9
12/08	163	151			22.5	21.5			197	110			37
12/09	171	158			16.2	15.7			215	131			52
12/10	170	156			19.7	19.2			196	120			36
12/11	163	149			22.9	21.8			197	110			26
12/12	170	156			17.5	17.1			200	120			37
12/13	168	154			18.0	16.9			186	135			8
12/14	164	150			13.2	12.6			184	141			14
12/15	166	152			17.9	17.0			196	119			44

Appendix 5. Size and Condition Database - October 1993 to July 1994 Yearling Chinook Salmon Woodbridge Dam

DATE	AVGTL (mm)	AVGFL (mm)	AVGWT (g)	AVGK	STDTL	STDFL	STDWT	STDK	MAXTL (mm)	MINTL (mm)	MAXWT (g)	MINWT (g)	N
12/16	161	146			18.3	16.8			193	122			37
12/17	165	152			13.9	13.2			188	128			26
12/18	160	146			23.5	21.9			190	110			18
12/19	155	142			24.5	21.5			180	123			8
12/20	175	160			17.1	15.8			205	151			15
12/21	164	151			20.8	20.9			198	116			16
12/22	179	165			17.8	17.1			201	136			15
12/23	157	144			19.7	19.0			187	112			20
12/24	159	144			19.8	18.2			187	127			19
12/25	171	156			15.3	14.6			197	136			14
12/26	181	166			19.5	17.9			205	143			11
12/27	179	164			21.3	20.4			208	123			30
12/28	186	169			16.0	14.9			209	152			25
12/29	168	154			19.2	18.0			197	122			36
12/30	172	157			20.8	19.9			203	131			17
12/31	168	155			19.8	19.0			215	115			29
01/01	170	156			17.0	14.8			181	152			3
01/02	172	158			20.0	19.7			201	131			16
01/03	167	152			25.3	23.7			205	121			18
01/04	176	164			21.3	20.2			205	123			15
01/05	172	157			19.4	18.3			207	123			60
01/06	170	155			22.7	21.5			205	125			20
01/07	181	166			10.3	9.5			198	163			15
01/08	176	164			16.6	15.6			197	135			16
01/09	169	155			26.6	24.8			207	119			27
01/10	178	163			22.5	21.2			207	123			17
01/11	170	155			23.6	21.9			207	123			26
01/12	179	164			23.8	22.0			210	122			42
01/13	186	171			19.5	16.9			214	137			32
01/14	183	167			19.9	17.8			211	135			28
01/15	181	165			21.3	18.6			212	135			30
01/16	173	159			19.4	18.3			192	115			18
01/17	185	169			12.8	10.9			212	165			13
01/18	173	161			12.7	13.4			195	125			15
01/19	176	162			16.4	15.6			205	144			32
01/20	183	168			19.0	18.0			210	141			21
01/21	188	174			12.9	12.8			212	165			18
01/22	191	177			15.8	15.2			224	164			20
01/23	177	163			18.5	18.2			251	146			40
01/24	188	172			18.4	16.6			217	151			45
01/25	180	165			19.0	17.4			215	119			87
01/26	179	164			17.1	16.3			211	129			69
01/27	188	172			15.2	13.1			210	157			18
01/28	184	168			15.9	13.5			213	161			21
01/29	182	167			15.1	13.8			208	157			12
01/30	181	167			8.7	8.8			192	162			15
01/31	166	151			18.5	16.3			181	156			3
02/01	176	161	41.6	7.44E-04	19.5	18.0	12.70	3.76E-05	205	115	65.8	12.3	25
02/02	175	161	39.3	7.20E-04	15.9	15.7	10.50	1.07E-04	204	130	54.0	16.6	23
02/03	162	149	32.4	7.59E-04	13.8	13.3	4.86	8.25E-05	180	139	38.1	23.5	8
02/04	168	155	35.7	7.44E-04	9.0	9.1	4.95	3.25E-05	181	154	43.5	28.4	11
02/05	177	161	42.0	7.33E-04	17.8	16.1	12.02	5.56E-05	212	125	76.7	14.3	35
02/06	172	158	40.3	7.88E-04	20.7	18.8	11.43	9.89E-05	202	145	56.0	28.0	10
02/07	182	166	46.4	7.53E-04	18.0	16.4	13.34	4.57E-05	218	133	76.3	19.5	38
02/08	186	169	47.3	7.38E-04	19.1	17.3	14.44	3.58E-05	217	152	72.1	24.1	21
02/09	173	156			24.2	25.0			196	117			9
02/10	166	150	36.9	7.71E-04	28.2	25.2	15.08	6.83E-05	197	115	58.8	13.2	9
02/11	170	154	32.2	6.43E-04	32.8	30.3	15.36	1.04E-04	206	144	52.5	21.5	5
02/12	189	174			2.1	2.8			190	187			2
02/13	170	155			17.7	16.0			191	147			7
02/14	76	70	3.1	7.06E-04	0.0	0.0			76	76	3.1	3.1	1
02/15	176	160	41.3	7.44E-04	15.0	13.9	10.80	7.71E-05	193	136	54.2	20.2	6
02/16	169	154	37.0	7.51E-04	21.7	20.8	13.04	3.97E-05	192	148	51.1	25.2	6
02/17	174	157	41.2	7.47E-04	28.1	25.5	16.26	4.11E-05	192	125	55.8	14.9	5
02/18	182	166	44.9	7.32E-04	16.9	15.8	11.64	3.82E-05	215	130	76.5	15.9	42
02/19	184	168	46.8	7.51E-04	9.8	9.8	7.05	5.44E-05	202	167	57.5	34.3	18
02/20	178	161	42.0	7.40E-04	15.2	15.1	11.26	4.99E-05	192	162	53.1	32.5	5
02/21	165	152	36.7	7.85E-04	25.5	24.7	16.89	1.10E-05	183	147	48.6	24.7	2
02/22													0
02/23	196	181	58.6	7.75E-04	5.7	4.9	8.91	5.11E-05	200	192	64.9	52.3	2
02/24													0
02/25													0
02/26	174	160	39.1	7.40E-04	3.7	2.8	5.12	5.72E-05	176	171	42.9	35.7	3
02/27													0
02/28													0
03/01	173	158	36.7	7.08E-04	8.5	3.5	3.96	2.77E-05	179	167	39.5	33.9	2

Appendix 5. **Size and Condition Database - October 1993 to July 1994** **Yearling Chinook Salmon** **Woodbridge Dam**

DATE	AVGTL (mm)	AVGFL (mm)	AVGWT (g)	AVGK	STDTL	STDFL	STDWT	STDK	MAXTL (mm)	MINTL (mm)	MAXWT (g)	MINWT (g)	N
03/02													0
03/03	155	140	29.2	7.57E-04	22.6	21.2	12.66	6.94E-06	171	139	38.1	20.2	2
03/04													0
03/05													0
03/06	189	174	58.2	8.63E-04	16.3	14.8	13.29	2.48E-05	200	177	67.6	48.8	2
03/07	137	125	19.1	7.43E-04	0.0	0.0	0.00	0.00E+00	137	137	19.1	19.1	1
03/08													0
03/09													0
03/10													0
03/11	165	150	20.0	4.45E-04	0.0	0.0	0.00	0.00E+00	165	165	20.0	20.0	1
03/12	170	153	38.6	7.87E-04	4.2	2.8	1.63	9.20E-05	173	167	39.7	37.4	2
03/13													0
03/14	142	131	16.0	5.59E-04	0.0	0.0	0.00	0.00E+00	142	142	16.0	16.0	1
03/15													0
03/16													0
03/17	139	126	20.9	7.78E-04	0.0	0.0	0.00	0.00E+00	139	139	20.9	20.9	1
03/18	147	135	27.3	8.59E-04	0.0	0.0	0.00	0.00E+00	147	147	27.3	27.3	1
03/19	175	155	36.9	6.89E-04	0.0	0.0	0.00	0.00E+00	175	175	36.9	36.9	1
03/20	167	152	34.3	7.36E-04	0.0	0.0	0.00	0.00E+00	167	167	34.3	34.3	1
03/21													0
03/22	139	128	21.0	7.82E-04	0.0	0.0	0.00	0.00E+00	139	139	21.0	21.0	1
03/23													0
03/24													
03/25													
03/26	167	150	39.3	8.44E-04	0.0	0.0	0.00	0.00E+00	167	167	39.3	39.3	1
03/27													0
03/28													0
03/29													0
03/30	160	142	30.0	7.32E-04	0.0	0.0	0.00	0.00E+00	160	160	30.0	30.0	1
03/31													0
04/01	185	166	49.2	7.77E-04	0.0	0.0	0.00	0.00E+00	185	185	49.2	49.2	1
04/02													0
04/03	179	162	42.3	7.38E-04	0.0	0.0	0.00	0.00E+00	179	179	42.3	42.3	1
04/04	168	154	35.3	7.41E-04	0.0	0.0	0.00	0.00E+00	171	163	38.3	30.7	3
04/05	158	144	31.4	8.01E-04	7.8	4.9	4.38	6.00E-06	163	152	34.5	28.3	2
04/06													0
04/07													0
04/08	126	118	15.2	7.60E-04	0.0	0.0	0.00	0.00E+00	126	126	15.2	15.2	1
04/09													0
04/10													0
04/11													0
04/12													0
04/13													0
04/14	198	178	59.2	7.63E-04	0.0	0.0	0.00	0.00E+00	198	198	59.2	59.2	1
04/15													0
04/16													0
04/17													0
04/18													0
04/19													0
04/20													0
04/21													0
04/22													0
04/23													0
04/24	220	205			0.0	0.0	0.00	0.00E+00	220	220			1
04/25	151	135	28.6	8.31E-04	0.0	0.0	0.00	0.00E+00	151	151	28.6	28.6	1
04/26													0
04/27													0
04/28	182	167	49.7	8.24E-04	0.0	0.0	0.00	0.00E+00	182	182	49.7	49.7	1
04/29													0
04/30													0
05/01													0
05/02													0
05/03	132	125	21.5	9.35E-04	0.0	0.0	0.00	0.00E+00	132	132	21.5	21.5	1
05/04													0
05/05													0
05/06													0
05/07													0
05/08													0
05/09													0
05/10													0
05/11	215	200	56.7	5.71E-04	0.0	0.0	0.00	0.00E+00	215	215	56.7	56.7	1
05/12													0
05/13													0
05/14													0
05/15													0
05/16													0

DATE	AVGTL (mm)	AVGFL (mm)	AVGWT (g)	AVGK	STDTL	STDFL	STDWT	STDK	MAXTL (mm)	MINTL (mm)	MAXWT (g)	MINWT (g)	N
05/17													0
05/18													0
05/19													0
05/20													0
05/21													0
05/22													0
05/23													0
05/24													0
05/25													0
05/26													0
05/27													0
05/28													0
05/29													0
05/30													0
05/31													0
06/01													0
06/02													0
06/03													0
06/04													0
06/05													0
06/06													0
06/07													0
06/08													0
06/09													0
06/10													0
06/11													0
06/12													0
06/13													0
06/14	168	145	37.9	7.99E-04	0.0	0.0	0.00	0.00E+00	168	168	37.9	37.9	1
06/15													0
06/16													0
06/17													0
06/18													0
06/19													0
06/20													0
06/21													0
06/22													0
06/23													0
06/24													0
06/25													0
06/26													0
06/27													0
06/28													0
06/29													0
06/30													0
07/01													0
07/02													0
07/03													0
07/04													0
07/05													0
07/06													0
07/07													0
07/08													0
07/09													0
07/10													0
07/11													0
07/12													0
07/13													0
07/14													0
07/15													0
07/16													0
07/17													0
07/18													0
07/19													0
07/20													0
07/21													0
07/22													0
07/23	182	165	46.2	7.66E-04	0.0	0.0	0.00	0.00E+00	182	182	46.2	46.2	1
07/24													0
07/25													0
07/26													0
07/27													0
07/28													0
07/29													0
07/30													0
07/31													0

DATE	AVG RIVERQ	WID CANALQ	WATERTEMP (F) AVG*	MAX	MIN	SECCHIDEPTH (cm) AM	PM	AVG	RAINFALL	BAROPRESS	MOONAGE	SUNRISE	SUNSET
10/11													
10/12													
10/13													
10/14	81								0.00	29.98	29	711	1831
10/15	135								0.08	29.95	0	712	1830
10/16	178		63.8	68.9	61.8	180	170	165	0.00	29.90	1	713	1828
10/17	178		61.4	61.8	61.0				0.00	29.90	2	714	1827
10/18	178		60.6	61.4	60.1				0.00	29.99	3	715	1825
10/19	429		59.7	60.5	59.1				0.00	30.08	4	716	1823
10/20	831		59.2	59.9	58.6				0.00	30.08	5	718	1822
10/21	884		58.7	59.3	58.2	120	115	117.5	0.00	30.05	6	719	1820
10/22	909		59.0	59.7	58.7	125	130	127.5	0.00	30.03	7	720	1819
10/23	912		58.7	59.1	58.4	127.5		127.5	0.00	30.02	8	721	1817
10/24	917		58.7	59.3	58.2	130	130	130	0.00	29.99	9	722	1816
10/25	750		58.8	59.3	58.4	130	130	130	0.00	29.97	10	724	1815
10/26	318		59.0	59.5	58.4	130	130	130	0.00	30.00	11	725	1813
10/27	290		58.8	59.5	58.2	130	130	130	0.00	30.01	12	726	1812
10/28	268		59.3	59.7	58.7	130	120	125	0.00	29.88	13	727	1810
10/29	254		59.0	59.5	58.6		130	130	0.00	29.82	14	729	1809
10/30	246		58.9	59.5	58.2	130	120	125	0.00	29.95	15	730	1808
10/31	241		58.8	59.5	58.2	130		130	0.00	29.95	16	631	1706
11/01	545		59.1	59.7	58.6	120		120	0.00	30.01	17	632	1705
11/02	517		59.0	59.5	58.6	30	60	45	0.00	30.19	18	634	1704
11/03	349		58.1	58.9	56.9	70		70	0.00	30.12	19	635	1702
11/04	335		57.1	58.9	55.4	60		60	0.00	30.00	20	636	1701
11/05	331		57.3	58.9	55.8	50	40	45	0.00	30.02	21	637	1700
11/06	332		57.1	58.8	55.6	45	45	45	0.00	29.92	22	639	1659
11/07	334		57.0	58.8	55.4	45		45	0.00	29.93	23	640	1705
11/08	337		56.9	58.8	55.4	50	50	50	0.00	30.04	24	641	1704
11/09	338		56.6	58.2	55.2	50	50	50	0.00	30.12	25	642	1702
11/10	345		56.7	58.2	55.4	50	50	50	0.00	29.94	26	644	1701
11/11	373		57.2	58.7	55.9	30	40	35	1.00	29.84	27	645	1700
11/12	351		57.9	59.3	56.9	52	55	53.5	0.26	29.84	28	646	1659
11/13	344		57.1	58.0	56.3	60	65	62.5	0.00	29.91	0	647	1658
11/14	342		56.1	57.2	55.0	55	50	52.5	0.00	30.05	1	649	1657
11/15	345		55.0	55.9	54.0	55	55	55	0.00	30.09	2	650	1657
11/16	345		54.1	55.6	52.7	65	60	62.5	0.00	30.12	3	651	1656
11/17	345		54.6	56.1	53.1	45	45	45	0.00	30.09	4	652	1655
11/18	342		55.7	57.2	54.1	50	45	47.5	0.00	30.23	5	653	1654
11/19	340		56.1	57.4	55.0	55	55	55	0.00	30.28	6	655	1653
11/20	339		55.5	56.7	54.1	70	70	70	0.00	30.16	7	656	1653
11/21	337		54.9	56.1	53.8	75	60	67.5	0.00	29.98	8	657	1652
11/22	338		54.6	55.6	53.4	50	45	47.5	trace	30.03	9	658	1651
11/23	337		56.0	57.4	54.5	45	50	47.5	0.00	30.21	10	700	1651
11/24	334		55.5	56.3	54.3	55	55	55	0.00	30.23	11	701	1650
11/25	337		53.1	54.0	51.8	65	75	70	0.00	30.17	12	702	1649
11/26	340		52.4	53.8	51.1	100	80	90	0.00	30.21	13	658	1649
11/27	339		53.0	54.5	51.1	55	50	52.5	trace	30.11	14	659	1648
11/28	360		53.1	54.1	52.0	50	55	52.5	0.00	29.97	15	700	1648
11/29	393		53.5	54.1	53.1	50	45	47.5	0.34	29.94	16	701	1648
11/30	379		54.7	55.9	53.6	20	20	20	0.77	30.16	17	702	1647
12/01	350		56.0	57.2	54.9	70	70	70	0.00	30.36	18	704	1647
12/02	336		55.0	55.8	54.1	80	80	80	0.00	30.35	19	705	1647
12/03	328		54.3	55.4	53.1	80	60	70	0.00	30.27	20	706	1646
12/04	326		54.0	54.9	53.1	70	60	65	0.00	30.16	21	707	1646
12/05	325		54.3	56.4	52.9	55	60	57.5	0.00	30.04	22	708	1646
12/06	324		53.9	54.7	52.9	60	65	62.5	0.00	30.08	23	709	1646
12/07	323		53.2	54.5	51.8	90	70	80	0.00	30.04	24	710	1646
12/08	328		53.4	54.3	49.6	80	60	70	0.00	30.01	25	711	1646
12/09	328		54.1	56.0	53.6	60	60	60	0.27	30.12	26	711	1646
12/10	316		55.4	56.3	54.7	80	70	75	0.01	30.12	27	712	1646
12/11	329		55.5	56.1	54.3	80	55	67.5	0.00	29.77	28	713	1646
12/12	316		54.3	55.0	53.2	65	55	60	0.61	30.16	29	714	1646
12/13	311		52.7	53.8	51.8	100	65	82.5	0.00	30.00	0	715	1646
12/14	326		52.3	53.2	51.3	65	45	55	0.59	29.87	1	716	1646
12/15	312		52.8	53.6	51.8	45	55	50	0.03	30.01	2	716	1646
12/16	271		52.6	53.2	51.8	85	70	77.5	0.00	30.11	3	717	1647
12/17	254		51.4	52.2	50.4	100	100	100	0.00	30.13	4	718	1647
12/18	252		51.2	51.8	50.4	100	100	100	0.00	30.12	5	718	1647
12/19	250		49.8	51.0	46.9	80	90	85	0.00	30.16	6	719	1648
12/20	249		48.8	49.6	48.4	85	85	85	0.00	30.23	7	719	1648
12/21	246		48.5	49.2	47.2	90	100	95	0.00	30.21	8	720	1649
12/22	246		49.0	49.2	48.5	100	100	100	0.00	30.32	9	720	1649
12/23	246		48.6	48.9	48.2	100	100	100	0.00	30.35	10	721	1650
12/24	246		47.8	48.4	47.2	100	100	100	0.00	30.47	11	721	1650
12/25	246		47.2	47.7	45.2	100		100	0.00	30.21	12	722	1651
12/26	245		47.2	47.5	46.9	100	100	100	0.00	30.02	13	722	1652
12/27	243		47.3	48.0	46.9	80	100	90	0.05	30.15	14	722	1652
12/28	243		48.7	49.9	47.9	100	100	100	0.08	30.32	15	723	1653
12/29	241		49.4	50.3	48.5	100	100	100	0.00	30.30	16	723	1654
12/30	241		49.1	49.7	48.0	100	100	100	0.00	30.18	17	723	1654
12/31	241		49.3	49.7	48.5	100	100	100	0.00	30.18	18	723	1655
01/01	241		49.1	49.6	48.5	100		100	0.03	30.31	19	724	1656

DATE	AVG RIVERQ	WID CANALQ	WATERTEMP (F) AVG*	MAX	MIN	SECCHIDEPTH (cm) AM	PM	AVG	RAINFALL	BAROPRESS	MOONAGE	SUNRISE	SUNSET
01/02	241		49.4	50.1	48.7	80	90	85	0.00	30.35	20	724	1656
01/03	239		50.2	50.8	49.7	100	80	90	0.00	30.24	21	724	1657
01/04	242		50.2	50.6	49.9	80	80	80	0.02	30.16	22	725	1658
01/05	241		49.6	49.9	49.4	85	100	92.5	0.08	30.20	23	725	1659
01/06	238		48.4	49.2	47.5	100	90	95	0.00	30.29	24	725	1700
01/07	239		47.3	48.0	46.4	100	90	95	0.00	30.30	25	725	1701
01/08	241		47.1	47.7	46.2	100	100	100	0.07	30.18	26	724	1702
01/09	240		48.4	49.8	47.4	100	100	100	0.00	30.15	27	724	1703
01/10	239		49.0	49.8	48.2	95	100	97.5	0.00	30.23	28	724	1704
01/11	236		47.8	49.1	46.5	100	100	100	0.00	30.28	0	724	1705
01/12	185		47.8	48.4	46.9	90	100	95	0.00	30.35	1	724	1706
01/13	159		47.7	48.2	47.0	100	100	100	0.00	30.27	2	724	1707
01/14	153		47.0	47.7	46.4	100	100	100	0.00	30.13	3	723	1708
01/15	151		47.1	47.5	46.5	100	100	100	0.00	30.11	4	723	1709
01/16	150		47.5	48.4	46.5	100	100	100	0.00	30.14	5	723	1710
01/17	150		48.0	48.7	47.0	100	100	100	0.00	30.19	6	722	1711
01/18	151		48.2	48.9	47.0	100	100	100	0.00	30.09	7	722	1712
01/19	149		48.4	49.1	46.9	100	100	100	0.00	30.03	8	721	1713
01/20	148		48.7	49.4	47.7	100	100	100	0.00	30.13	9	721	1714
01/21	148		48.9	49.6	48.0	80	80	80	0.00	30.19	10	720	1715
01/22	148		49.3	50.1	48.5	90	100	95	0.01	30.04	11	720	1716
01/23	174		51.3	52.4	50.3	100	100	100	0.74	29.90	12	718	1717
01/24	169		51.3	52.2	50.8	60	60	60	0.39	29.89	13	718	1718
01/25	159		49.6	50.6	48.5	80	70	75	0.13	29.97	14	717	1720
01/26	152		50.1	50.8	49.4	60	90	75	0.00	30.11	15	716	1721
01/27	146		49.9	50.8	49.2	100	100	100	0.00	30.02	16	716	1722
01/28	144		48.9	49.9	48.0	100	100	100	0.00	30.14	17	715	1723
01/29	143		48.3	49.1	47.2	100	90	95	0.00	30.33	18	714	1724
01/30	144		47.8	48.4	46.9	80	100	90	0.00	30.28	19	713	1725
01/31	144		47.7	48.4	46.9	100	100	100	0.00	30.28	20	713	1726
02/01	144		47.9	48.4	47.0	90	90	90	0.00	30.30	21	712	1727
02/02	144		47.8	48.2	46.9	100	100	100	0.00	30.11	22	711	1728
02/03	142		47.8	49.1	46.9	100	100	100	0.00	30.02	23	710	1730
02/04	143		49.1	50.3	48.5	100	100	100	0.00	30.03	24	709	1731
02/05	144		50.0	50.8	49.1	100	100	100	0.00	30.08	25	708	1732
02/06	154		51.1	51.8	50.3	90	100	95	0.87	29.84	26	707	1733
02/07	172		50.3	51.5	49.6	50	55	52.5	0.62	29.54	27	706	1734
02/08	165		48.5	50.3	47.4	55	55	55	0.62	29.84	28	705	1737
02/09	151		47.7	48.6	46.4	75	80	77.5	0.00	30.22	29	704	1738
02/10	150		49.1	50.1	48.2	75	80	77.5	0.00	30.07	0	703	1739
02/11	143		49.7	50.6	48.7	75	85	80	0.00	30.24	1	702	1740
02/12	143		50.3	52.0	48.9	100	100	100	0.00	30.39	2	701	1741
02/13	144		51.6	53.1	50.1	100	100	100	0.00	30.27	3	700	1743
02/14	144		52.7	54.0	51.3	100	90	95	0.24	30.14	4	659	1744
02/15	144		53.6	54.3	52.9	95	85	90	0.00	30.07	5	657	1745
02/16	145		54.3	55.4	53.1	80	75	77.5	0.00	29.82	6	656	1746
02/17	176		54.9	56.5	53.4	60	40	50	0.46	29.63	7	655	1747
02/18	166		55.9	57.1	54.3	50	15	32.5	0.28	29.82	8	654	1748
02/19	164		56.4	57.6	54.9	55	75	65	0.16	29.86	9	653	1749
02/20	175		56.6	57.6	55.2	65	60	62.5	0.38	29.99	10	651	1750
02/21	169		56.2	57.2	55.0	75	75	75	0.15	30.14	11	650	1751
02/22	157		56.4	57.2	55.8	65	80	72.5	0.15	30.23	12	649	1752
02/23	150		55.2	56.1	54.0	75	90	82.5	trace	30.16	13	647	1753
02/24	146		55.3	56.1	53.8	95	95	95	0.00	30.12	14	646	1754
02/25	145		56.2	57.1	55.4	75	85	80	0.00	29.93	15	645	1755
02/26	145		57.0	57.6	56.1	85	85	85	0.07	30.02	16	643	1756
02/27	146		57.1	57.8	56.3	100	90	95	0.10	30.11	17	642	1757
02/28	144		56.6	57.4	55.6	140	130	135	0.00	30.13	18	641	1758
03/01	142		56.1	57.1	55.2	95	105	100	0.00	30.17	19	639	1759
03/02	141		57.0	58.2	56.1	95	85	90	0.00	30.11	20	638	1800
03/03	140		58.0	59.9	57.1	85	85	85	0.00	30.10	21	636	1801
03/04	139		58.1	59.5	57.4	95	80	87.5	0.00	30.10	22	635	1802
03/05	143		58.0	58.4	57.6	95	95	95	0.00	29.97	23	634	1803
03/06	144		57.3	58.4	56.3	90	90	90	0.15	29.93	24	632	1804
03/07	123	0	57.7	58.9	56.9	120	120	120	0.00	29.96	25	631	1805
03/08	114	0	57.2	58.4	56.3	105	125	115	0.00	30.02	26	629	1806
03/09	112	0	57.9	59.5	56.7	60	100	80	0.00	30.07	27	628	1807
03/10	112	0	58.6	59.7	57.8	70	80	75	0.00	30.06	28	626	1808
03/11	106	0	58.8	59.5	58.2	95	90	92.5	0.00	30.11	0	625	1809
03/12	105	0	58.0	58.7	57.4	95	125	110	0.00	30.26	1	622	1810
03/13	108	0	57.3	57.8	56.7	110	125	117.5	0.00	30.24	2	621	1811
03/14	104	0	57.2	57.8	56.5	120	110	115	0.00	30.04	3	619	1812
03/15	103	0	57.2	58.2	56.3	125	140	132.5	0.00	29.98	4	618	1813
03/16	99	0	58.5	60.3	56.9	200	190	195	0.00	30.03	5	616	1814
03/17	99	0	60.5	61.6	59.3	140	180	160	0.00	29.96	6	615	1815
03/18	98	0	61.2	62.0	60.5	195	185	190	0.00	29.83	7	613	1816
03/19	95	0	61.7	63.0	60.6	165	190	177.5	0.00	29.86	8	612	1817
03/20	91	0	62.1	63.2	61.0	200	200	200	0.00	30.05	9	610	1819
03/21	97	0	62.4	63.2	61.4	180	175	177.5	0.00	30.06	10	609	1819
03/22	97	0	62.9	63.6	62.0	175	135	155	0.00	29.99	11	607	1820
03/23	108	0	63.6	64.6	62.4	130	140	135	0.00	29.90	12	606	1821
03/24	112	0	63.7	64.6	62.8	130	125	127.5	0.00	29.69	13	604	1822
03/25	114	0	64.0	65.0	63.0	135	140	137.5	0.05	29.88	14	603	1823

DATE	AVG RIVERQ	WID CANALQ	WATERTEMP (F) AVG*	WATERTEMP (F) MAX	WATERTEMP (F) MIN	SECCHIDEPTH (cm) AM	SECCHIDEPTH (cm) PM	SECCHIDEPTH (cm) AVG	RAINFALL	BAROPRESS	MOONAGE	SUNRISE	SUNSET
03/26	115	30	63.5	64.2	62.8	155	200	177.5	0.00	30.03	15	601	1824
03/27	116	54	61.9	63.0	61.0	190	190	190	0.00	30.08	16	600	1825
03/28	105	54	61.2	61.6	60.8	150	170	160	0.00	30.12	17	558	1826
03/29	103	54	60.6	62.2	59.5	160	150	155	0.00	30.15	18	557	1827
03/30	112	48	60.4	61.4	59.5	175	135	155	0.00	30.20	19	555	1828
03/31	103	49	61.3	62.8	59.9	130	140	135	0.00	30.14	20	554	1827
04/01	95	42	62.7	64.2	61.4	135	145	140	0.00	30.07	21	551	1828
04/02	102	52	64.0	65.6	62.6	145	140	142.5	0.00	30.04	22	550	1828
04/03	109	58	64.6	66.0	63.4	125	150	137.5	0.00	30.03	23	648	1929
04/04	104	84	65.9	67.7	64.6	140	130	135	0.00	30.02	24	647	1930
04/05	101	95	66.0	66.7	65.2	145	140	142.5	0.00	30.02	25	645	1934
04/06	108	87	66.1	67.3	64.8	150	150	150	0.00	30.04	26	644	1935
04/07	114	85	66.4	67.9	65.2	145	170	157.5	0.00	30.04	27	642	1936
04/08	112	85	65.6	66.7	64.8	140	145	142.5	0.00	29.94	28	641	1937
04/09	115	82	65.6	66.2	65.2	160	160	160	0.21	29.98	29	639	1938
04/10	114	80	64.4	65.0	63.6	160	170	165	0.00	30.06	0	638	1939
04/11	113	75	64.2	64.8	63.6	135	150	142.5	0.22	30.09	1	636	1940
04/12	115	73	63.0	63.8	61.6	175	200	187.5	0.00	30.06	2	635	1941
04/13	116	81	60.6	61.6	59.7	130	170	150	0.00	29.93	3	633	1942
04/14	115	79	58.0	59.5	57.2	140	135	137.5	0.00	29.87	4	632	1942
04/15	114	85	58.1	59.3	57.4	150	145	147.5	0.00	29.93	5	631	1943
04/16	112	87	59.2	59.9	58.7	160	145	152.5	0.00	30.02	6	629	1944
04/17	121	82	60.6	61.6	59.9	140	140	140	0.00	30.04	7	628	1945
04/18	129	83	61.6	62.8	61.0	125	120	122.5	0.00	30.01	8	626	1946
04/19	155	88	62.6	63.6	61.8	130	120	125	0.00	30.02	9	625	1947
04/20	162	88	63.0	63.6	62.2	120	115	117.5	0.00	29.95	10	624	1948
04/21	160	90	63.3	64.4	62.6	140	130	135	0.00	29.98	11	622	1949
04/22	155	104	63.9	64.8	63.2	150	145	147.5	0.00	29.95	12	621	1950
04/23	157	112	64.2	65.0	63.8	145	165	155	0.08	29.80	13	620	1951
04/24	173	111	64.7	65.2	64.2	130	130	130	0.18	29.86	14	619	1952
04/25	185	106	63.5	64.8	62.6	115	105	110	0.28	29.80	15	617	1953
04/26	186	90	62.5	63.4	62.2	145	145	145	0.59	29.87	16	616	1953
04/27	202	71	62.2	62.8	61.4	160	150	155	0.00	29.87	17	615	1954
04/28	177	100	63.5	65.2	62.2	160	145	152.5	0.20	29.99	18	614	1955
04/29	173	102	65.5	66.9	64.6	165	160	162.5	0.00	30.09	19	612	1956
04/30	179	102	67.0	68.3	66.0	150	160	155	0.00	30.06	20	611	1957
05/01	177	102	66.8	67.3	66.5	145	135	140	0.00	30.02	21	610	1958
05/02	180	99	66.1	67.3	65.6	155	140	147.5	0.00	30.00	22	609	1959
05/03	163	100	66.0	67.1	65.2	145	140	142.5	0.00	30.00	23	608	2000
05/04	154	106	64.7	65.6	63.4	150	145	147.5	0.00	29.90	24	606	2001
05/05	153	115	62.3	63.2	61.2	150	150	150	0.00	29.84	25	604	2002
05/06	152	116	60.3	61.0	59.3	145	145	145	0.00	29.93	26	602	2003
05/07	172	106	59.4	60.3	58.7	130	130	130	0.79	30.01	27	601	2004
05/08	168	102	59.5	59.9	58.9	130	120	125	0.00	29.98	28	600	2004
05/09	159	100	59.2	60.1	58.6	110	120	115	0.00	29.97	29	559	2005
05/10	160	100	60.2	61.4	59.3	115	160	137.5	0.00	29.95	0	558	2006
05/11	158	102	61.9	63.6	60.5	110	150	130	0.00	29.94	1	557	2007
05/12	154	100	64.0	65.4	62.8	140	150	145	0.00	29.90	2	557	2008
05/13	151	99	65.4	66.9	64.2	130	145	137.5	0.00	29.85	3	556	2009
05/14	151	103	66.4	67.7	65.2	130	170	150	0.00	29.81	4	555	2010
05/15	148	104	64.9			120	125	122.5	0.00	29.94	5	554	2012
05/16	146	102	63.0			120	120	120	0.00	29.89	6	553	2012
05/17	156	96	62.4			130	130	130	0.10	29.86	7	552	2013
05/18	167	94	61.3			140	140	140	0.05	29.94	8	551	2014
05/19	162	86	59.9			155	140	147.5	0.00	30.05	9	551	2015
05/20	177	66	59.4			125	120	122.5	0.00	30.00	10	550	2016
05/21	164	56	60.4			150	170	160	0.00	29.91	11	549	2017
05/22	151	58	61.5			160	145	152.5	0.00	29.90	12	549	2017
05/23	144	65	63.9			110	140	125	0.00	29.92	13	548	2018
05/24	134	82	65.8			180	145	162.5	0.00	29.84	14	547	2019
05/25	138	98	66.7				145	145	0.00	29.78	15	547	2020
05/26	129	107	68.9	72.7	66.5	140	185	162.5	0.00	29.81	16	546	2021
05/27	131	104	66.4	67.3	65.4	185	140	162.5	0.00	29.89	17	546	2021
05/28	128	108	66.3	67.7	65.2	170	135	152.5	0.00	29.93	18	545	2022
05/29	121	106	66.5	68.6	65.2	150	150	150	0.00	29.86	19	545	2023
05/30	126	106	67.0	68.1	66.0	150	150	150	0.00	29.76	20	544	2023
05/31	131	114	66.5	67.7	65.8	120	145	132.5	0.00	29.94	21	544	2024
06/01	137	114	65.3	66.0	64.8	145		145	0.00	29.99	22	543	2025
06/02	137	124	65.5	66.9	64.4	170	120	145	0.00	29.91	23	543	2026
06/03	132	132	65.7	66.7	64.8	135		135	0.00	29.93	24	543	2026
06/04	129	130	65.3	66.7	64.4	140	140	140	0.00	29.97	25	542	2027
06/05	126	126	65.2	66.2	64.6	160	140	150	0.00	29.94	26	542	2027
06/06	126	120	65.2	66.7	64.4	155	145	150	0.00	29.99	27	542	2028
06/07	120	127	64.5	65.0	64.0	120	155	137.5	0.00	30.00	28	542	2029
06/08	125	126	64.5	65.2	63.8	185	125	155	0.00	29.96	29	542	2029
06/09	134	142	65.1	66.7	64.4	180	175	177.5	0.00	29.87	0	541	2030
06/10	142	152	66.4	67.7	65.6	170	130	150	0.00	29.80	1	541	2030
06/11	141	166	67.2	68.6	66.0	185	165	175	0.00	29.80	2	541	2031
06/12	133	174	67.3	69.0	66.2	150	170	160	0.00	29.81	3	541	2031
06/13	155	179	66.6	67.3	65.6	130	140	135	0.00	29.83	4	541	2031
06/14	153	185	65.1	66.2	64.0	155	120	137.5	0.00	29.80	5	541	2032
06/15	149	186	64.2	65.2	63.0	130	180	155	0.00	29.86	6	541	2032
06/16	148	187	63.6	64.6	62.2	165	175	170	0.00	29.99	7	541	2033

DATE	AVG RIVERQ	WID CANALQ	WATERTEMP (F) AVG*	WATERTEMP (F) MAX	WATERTEMP (F) MIN	SECCHIDEPTH (cm) AM	SECCHIDEPTH (cm) PM	SECCHIDEPTH (cm) AVG	RAINFALL	BAROPRESS	MOONAGE	SUNRISE	SUNSET
06/17	103	186	64.0	65.8	62.4	170	200	185	0.00	29.97	8	541	2033
06/18	71	180	64.8	66.0	63.8	200	200	200	0.00	29.90	9	541	2033
06/19	85	173	65.9	67.9	64.8	160	150	155	0.00	29.87	10	542	2033
06/20	79	165	67.3	68.8	66.0	140	130	135	0.00	29.95	11	542	2034
06/21	73	145	67.6	68.8	66.2	180	175	177.5	0.00	29.98	12	542	2034
06/22	70	133	68.0	69.0	67.1	190		190	0.00	29.95	13	542	2034
06/23	44	132	68.5	69.8	67.3		210	210	0.00	29.98	14	542	2034
06/24	30	133	69.4	70.7	67.9				0.00	29.90	15	543	2034
06/25	29	127	70.1	71.4	68.8				0.00	29.88	16	543	2034
06/26	42	115	70.5	71.8	69.2	180	180	180	0.00	29.90	17	543	2035
06/27	52	110	71.0	71.8	69.6				0.00	29.89	18	544	2035
06/28	37	122	71.4	72.5	70.3				0.00	29.92	19	544	2035
06/29	29	140	72.0	73.4	70.7				0.00	29.89	20	544	2035
06/30	28	146	72.4	73.4	71.4				0.00	29.87	21	545	2035
07/01	28	147	72.6	73.9	71.4				0.00	29.85	22	545	2034
07/02	28	156	72.4	73.2	71.4				0.00	29.83	23	546	2034
07/03	28	158	72.3	73.2	71.2				0.00	29.79	24	546	2034
07/04	28	154	71.9	72.7	70.9				0.00	29.76	25	547	2034
07/05	31	156	71.9	73.4	70.5				0.00	29.85	26	547	2034
07/06	54	149	71.0	72.1	69.6				0.00	29.90	27	548	2034
07/07	43	134	71.0	72.1	69.8				0.00	29.81	28	549	2033
07/08	30	131	71.7	73.2	70.3				0.00	29.77	0	549	2033
07/09	29	140	72.4	73.9	71.2				0.00	29.82	1	550	2033
07/10	28	140	73.0	74.3	71.8				0.00	29.89	2	550	2032
07/11	28	145	73.1	74.6	71.8	180	150	165	0.00	29.89	3	551	2032
07/12	28	149	73.1	74.6	71.8	170	140	155	0.00	29.84	4	552	2032
07/13	28	155	72.9	73.9	71.4	170		170	0.00	29.80	5	552	2031
07/14	29	150	72.8	74.1	71.4				0.00	29.76	6	553	2031
07/15	29	150	72.4	73.2	70.9		180	180	0.00	29.79	7	554	2030
07/16	29	140	72.1	73.2	70.9	190	180	185	0.00	29.86	8	554	2030
07/17	38	126	72.3	73.6	70.9	170	180	175	0.00	29.88	9	555	2029
07/18	56	123	72.0	73.6	70.7	180	180	180	0.00	29.90	10	556	2028
07/19	43	129	71.3	72.3	70.3	170	150	160	0.00	29.94	11	557	2028
07/20	32	136	71.0	72.3	69.8	170	170	170	0.00	29.94	12	557	2027
07/21	32	146	70.3	71.2	69.2	160	170	165	0.00	29.92	13	558	2027
07/22	36	156	70.3	72.1	68.8	150	150	150	0.00	29.90	14	559	2026
07/23	36	159	69.6	70.9	68.1	170		170	0.00	29.95	15	600	2025
07/24	31	159	69.2	70.7	67.9	160	150	155	0.00	30.01	16	600	2024
07/25	31	154	70.1	71.8	68.6	170	170	170	0.00	29.96	17	601	2024
07/26	31	152	70.3			210	190	200	0.00	29.92	18	602	2022
07/27	30	159	71.4			180	170	175	0.00	29.89	19	603	2021
07/28	30	160	71.4			160	160	160	0.00	29.84	20	604	2020
07/29	31	163	72.5			170	190	180	0.00	29.80	21	605	2019
07/30	31	167	71.4			160	120	140	0.00	29.82	22	605	2018
07/31	30	166	71.4			150		150	0.00	29.92	23	606	2017

Notes:
* Average of two measurements (AM/PM) during day in bold; all others average of hourly datalogger measurements.
Mokelumne River flow data from U.S.G.S. gaging station #11325500 at Woodbridge, CA.
Water temperatures were recorded hourly with a Ryan TM2000 submersible thermograph installed in pool #6a of low-stage fishway.
Secchi depth measured twice daily in pool #9a of low-stage fishway, or from screw trap platform located about mid-channel below Woodbridge Dam, or immediately upstream of spill bay #1 in Lake Lodi.
Rainfall measured by National Weather Service station at Camanche Reservoir N., San Joaquin Co., CA.
Barometric pressure measured hourly and average daily value computed by National Weather Service station at Stockton, CA.
Lunar and solar data compiled from tables in the Old Farmer's Almanac, 1994 edition, Yankee Publishing, Dublin, NH.

Appendix 7. Delta Outflow (in CFS), January 1994 - July 1994

JANUARY 1994

DATE	SACRAMENTO RIVER AT FREEPORT	SACRAMENTO TREATMENT PLANT	SAN JOAQUIN RIVER NEAR VERNALIS	TOTAL COLUMNS 1, 2 & 3	TRACY PUMP	CONTRA COSTA PUMP	CLIFTON COURT FOREBAY INFLOW	BYRON-BETHANY IRRIGATION DIST.	TOTAL EXPORT	NET CONSUMPTIVE USE	TOTAL DEMAND	TOTAL OUTFLOW INDEX
1	16,091	138	1,551	17,780	4,033	104	4,194	0	8,331	(600)	7,731	10,049
2	15,328	138	1,557	17,023	3,950	103	3,184	0	7,237	(700)	6,537	10,486
3	14,838	138	1,716	16,692	3,918	105	2,791	0	6,814	(800)	6,014	10,678
4	14,211	138	1,789	16,138	4,040	104	1,991	0	6,135	(800)	5,335	10,803
5	13,744	138	1,836	15,718	4,065	102	1,993	0	6,160	(900)	5,260	10,458
6	13,791	138	1,999	15,928	3,731	105	1,996	0	5,832	(900)	4,932	10,996
7	13,658	138	1,931	15,727	3,486	80	2,199	0	5,765	(900)	4,865	10,862
8	12,890	138	1,917	14,945	2,395	72	2,194	0	4,661	(900)	3,761	11,184
9	12,578	138	1,917	14,633	1,951	64	1,997	0	4,012	(900)	3,112	11,521
10	12,611	138	1,903	14,652	1,968	66	1,999	0	4,033	(900)	3,133	11,519
11	13,078	138	1,856	15,072	1,967	67	2,993	0	5,027	(1,000)	4,027	11,045
12	12,644	138	1,856	14,638	1,961	88	2,492	0	4,541	(1,000)	3,541	11,097
13	12,606	138	1,944	14,688	1,956	103	3,197	0	5,256	(1,000)	4,256	10,432
14	12,123	138	1,856	14,117	1,289	109	3,298	0	4,696	(1,000)	3,696	10,421
15	11,891	138	1,802	13,831	968	108	3,995	0	5,071	(1,000)	4,071	9,760
16	11,773	138	1,632	13,543	968	105	3,998	0	5,071	(1,000)	4,071	9,472
17	11,956	138	1,569	13,663	967	106	3,996	0	5,069	(1,000)	4,069	9,594
18	11,944	138	1,601	13,683	856	109	3,194	0	4,159	(1,000)	3,159	10,524
19	12,182	138	1,607	13,927	816	105	3,199	0	4,120	(1,000)	3,120	10,807
20	12,505	138	1,658	14,301	814	106	3,596	0	4,516	(1,000)	3,516	10,785
21	12,489	138	1,749	14,376	815	107	3,895	0	4,817	(900)	3,917	10,459
22	12,082	138	1,684	13,904	808	107	3,503	0	4,418	(900)	3,518	10,386
23	11,941	138	1,557	13,636	805	103	4,744	0	5,652	(900)	4,752	8,884
24	12,008	138	1,658	13,804	799	101	4,502	0	5,402	(900)	4,502	9,302
25	13,351	138	1,749	15,238	784	101	7,004	0	7,889	(900)	6,989	8,249
26	16,335	138	1,951	18,424	1,099	94	5,991	0	7,184	(900)	6,284	12,140
27	21,949	138	1,999	24,086	2,692	94	4,000	0	6,786	(900)	5,886	18,200
28	24,084	138	1,869	26,091	3,816	91	3,562	0	7,469	(900)	6,569	19,522
29	22,365	138	1,769	24,272	4,293	95	4,062	0	8,450	(900)	7,550	16,722
30	19,355	138	1,723	21,216	4,331	99	5,135	0	9,565	(900)	8,665	12,551
31	17,114	138	1,690	18,942	4,249	98	3,472	0	7,819	(900)	6,919	12,023
TOTAL	445,515	4,278	54,895	504,688	70,590	3,001	108,366	0	181,957	(28,200)	153,757	350,931
AVERAGE	14,371	138	1,771	16,280	2,277	97	3,496	0	5,870	(910)	4,960	11,320

Appendix 7. Delta Outflow (in CFS), January 1994 - July 1994

FEBRUARY 1994

DATE	SACRAMENTO RIVER AT FREEPORT	SACRAMENTO TREATMENT PLANT	SAN JOAQUIN RIVER NEAR VERNALIS	TOTAL COLUMNS 1, 2 & 3	TRACY PUMP	CONTRA COSTA PUMP	CLIFTON COURT FOREBAY INFLOW	BYRON-BETHANY IRRIGATION DIST.	TOTAL EXPORT	NET CONSUMPTIVE USE	TOTAL DEMAND	TOTAL OUTFLOW INDEX
1	15,520	138	1,652	17,310	4,170	99	0	0	4,269	(900)	3,369	13,941
2	13,593	138	1,620	15,351	4,162	97	0	0	4,259	(800)	3,459	11,892
3	13,043	138	1,601	14,782	3,798	97	0	0	3,895	(800)	3,095	11,687
4	12,442	138	1,582	14,162	3,310	97	395	0	3,802	(800)	3,002	11,160
5	12,239	138	1,557	13,934	3,188	97	0	0	3,285	(800)	2,485	11,449
6	11,996	138	1,551	13,685	3,194	97	0	0	3,291	(800)	2,491	11,194
7	11,987	138	1,551	13,676	3,817	90	4,464	0	8,371	(800)	7,571	6,105
8	13,512	138	1,632	15,282	4,219	88	5,994	0	10,301	(800)	9,501	5,781
9	20,080	138	1,809	22,027	4,235	90	5,000	0	9,325	(800)	8,525	13,502
10	29,802	138	2,792	32,732	4,260	88	1,475	0	5,823	(700)	5,123	27,609
11	29,972	138	2,736	32,846	4,191	89	2,617	0	6,897	(700)	6,197	26,649
12	26,464	138	2,548	29,150	4,093	100	2,501	0	6,694	(700)	5,994	23,156
13	23,784	138	2,277	26,199	4,099	96	2,446	0	6,641	(700)	5,941	20,258
14	23,496	138	2,034	25,668	4,085	100	2,898	0	7,083	(700)	6,383	19,285
15	21,560	138	1,910	23,608	4,096	108	2,497	0	6,701	(700)	6,001	17,607
16	19,186	138	1,802	21,126	4,059	121	2,503	0	6,683	(600)	6,083	15,043
17	17,177	138	1,769	19,084	4,131	114	2,493	0	6,738	(600)	6,138	12,946
18	16,157	138	1,749	18,044	4,157	110	2,000	0	6,267	(600)	5,667	12,377
19	17,022	138	1,842	19,002	4,104	103	2,495	0	6,702	(600)	6,102	12,900
20	19,338	138	2,125	21,601	4,108	102	1,599	0	5,809	(600)	5,209	16,392
21	23,458	138	2,314	25,910	4,100	103	1,593	0	5,796	(600)	5,196	20,714
22	25,116	138	2,373	27,627	4,088	97	1,502	0	5,687	(600)	5,087	22,540
23	28,909	138	2,418	31,465	4,080	80	572	0	4,732	(500)	4,232	27,233
24	28,238	138	2,441	30,817	3,536	82	495	0	4,113	(500)	3,613	27,204
25	25,596	138	2,336	28,070	3,284	101	1,055	0	4,440	(500)	3,940	24,130
26	22,998	138	2,190	25,326	3,301	91	1,967	0	5,359	(500)	4,859	20,467
27	20,937	138	2,076	23,151	3,249	131	2,309	0	5,689	(500)	5,189	17,962
28	19,321	138	2,013	21,472	3,233	118	2,522	0	5,873	(500)	5,373	16,099
29												
30												
31												
TOTAL	562,943	3,864	56,300	623,107	108,347	2,786	53,392	0	164,525	(18,700)	145,825	477,282
AVERAGE	20,105	138	2,011	22,254	3,870	100	1,907	0	5,876	(668)	5,208	17,046

Appendix 7. Delta Outflow (in CFS), January 1994 - July 1994

MARCH 1994

DATE	SACRAMENTO RIVER AT FREEPORT	SACRAMENTO TREATMENT PLANT	SAN JOAQUIN RIVER NEAR VERNALIS	TOTAL COLUMNS 1, 2 & 3	TRACY PUMP	CONTRA COSTA PUMP	CLIFTON COURT FOREBAY INFLOW	BYRON-BETHANY IRRIGATION DIST.	TOTAL EXPORT	NET CONSUMPTIVE USE	TOTAL DEMAND	TOTAL OUTFLOW INDEX
1	17,992	138	1,951	20,081	3,233	47	2,617	0	5,897	(400)	5,497	14,584
2	18,275	138	1,896	20,309	3,218	0	1,859	0	5,077	(400)	4,677	15,632
3	18,305	138	1,890	20,333	2,882	0	2,199	0	5,081	(400)	4,681	15,652
4	17,504	138	1,903	19,545	2,713	68	2,306	0	5,087	(400)	4,687	14,858
5	17,077	138	2,020	19,235	2,711	140	2,227	0	5,078	(400)	4,678	14,557
6	16,378	138	2,329	18,845	2,705	151	1,384	0	4,240	(300)	3,940	14,905
7	16,311	138	2,321	18,770	2,707	149	2,300	0	5,156	(300)	4,856	13,914
8	16,462	138	2,351	18,951	2,239	155	2,395	0	4,789	(300)	4,489	14,462
9	16,483	138	2,388	19,009	2,002	140	2,463	0	4,605	(300)	4,305	14,704
10	16,016	138	2,494	18,648	2,001	145	2,794	34	4,906	(300)	4,606	14,042
11	15,151	138	2,456	17,745	2,006	144	2,792	32	4,910	(300)	4,610	13,135
12	14,893	138	2,418	17,449	2,497	147	2,156	30	4,770	(300)	4,470	12,979
13	14,120	138	2,351	16,609	2,732	142	1,900	30	4,744	(200)	4,544	12,065
14	13,703	138	2,314	16,155	2,725	142	1,799	19	4,647	(200)	4,447	11,708
15	13,549	138	2,358	16,045	2,716	142	1,695	24	4,529	(200)	4,329	11,716
16	13,056	138	2,373	15,567	1,933	140	2,494	11	4,556	(200)	4,356	11,211
17	13,099	138	2,396	15,633	1,991	145	2,195	15	4,316	(200)	4,116	11,517
18	12,775	138	2,594	15,507	1,965	131	2,498	13	4,581	(200)	4,381	11,126
19	11,944	138	2,433	14,515	2,407	129	1,696	13	4,219	(100)	4,119	10,396
20	12,780	138	2,381	15,299	2,674	135	1,495	0	4,304	(100)	4,204	11,095
21	12,690	138	2,373	15,201	2,378	138	1,583	22	4,077	(100)	3,977	11,224
22	11,874	138	2,284	14,296	1,969	136	1,791	20	3,876	(100)	3,776	10,520
23	11,394	138	2,190	13,722	1,968	136	1,592	10	3,686	(100)	3,586	10,136
24	11,739	138	2,147	14,024	1,955	139	1,698	16	3,776	(100)	3,676	10,348
25	11,232	138	2,111	13,481	1,912	137	2,109	28	4,130	0	4,130	9,351
26	10,836	138	2,147	13,121	1,876	133	1,770	25	3,754	0	3,754	9,367
27	11,098	138	2,147	13,383	1,860	135	1,893	25	3,863	0	3,863	9,520
28	10,808	138	2,104	13,050	2,448	137	1,666	25	4,226	100	4,326	8,724
29	9,725	138	2,034	11,897	2,716	137	1,243	25	4,071	100	4,171	7,726
30	10,200	138	1,978	12,316	606	134	938	25	1,853	200	2,053	10,263
31	9,777	138	1856	11,771	359	129	0	64	424	300	724	11,047
TOTAL	427,246	4,278	68,988	500,512	70,304	3,883	59,547	506	133,228	(5,200)	128,028	372,484
AVERAGE	13,782	138	2,225	16,146	2,268	125	1,921	16	4,298	(168)	4,130	12,016

Appendix 7. Delta Outflow (in CFS), January 1994 - July 1994

APRIL 1994

DATE	SACRAMENTO RIVER AT FREEPORT	SACRAMENTO TREATMENT PLANT	SAN JOAQUIN RIVER NEAR VERNALIS	TOTAL COLUMNS 1, 2 & 3	TRACY PUMP	CONTRA COSTA PUMP	CLIFTON COURT FOREBAY INFLOW	BYRON-BETHANY IRRIGATION DIST.	TOTAL EXPORT	NET CONSUMPTIVE USE	TOTAL DEMAND	TOTAL OUTFLOW INDEX
1	9,614	138	1,836	11,588	973	126	120	93	1,126	400	1,526	10,062
2	9,016	138	1,769	10,923	2,142	117	500	31	2,728	500	3,228	7,695
3	9,594	138	1,703	11,435	2,618	127	0	50	2,695	600	3,295	8,140
4	9,729	138	1,842	11,709	2,568	136	0	50	2,654	700	3,354	8,355
5	9,751	138	1,736	11,625	2,419	138	445	113	2,889	800	3,689	7,936
6	8,487	138	1,658	10,283	2,429	141	398	100	2,868	800	3,668	6,615
7	8,454	138	1,588	10,180	2,435	135	144	111	2,603	900	3,503	6,677
8	8,722	138	1,514	10,374	2,425	143	490	111	2,947	900	3,847	6,527
9	8,038	138	1,514	9,690	2,123	145	345	76	2,537	900	3,437	6,253
10	8,152	138	1,677	9,967	1,703	150	783	83	2,553	1,000	3,553	6,414
11	8,399	138	1,729	10,266	1,704	135	136	32	1,943	1,000	2,943	7,323
12	8,945	138	1,526	10,609	2,151	149	183	50	2,433	1,000	3,433	7,176
13	8,172	138	1,447	9,757	1,753	146	0	109	1,790	1,000	2,790	6,967
14	8,146	138	1,423	9,707	1,308	142	393	114	1,729	1,000	2,729	6,978
15	8,276	138	1,400	9,814	1,603	120	145	125	1,743	1,100	2,843	6,971
16	7,554	138	1,335	9,027	1,026	141	0	101	1,066	1,100	2,166	6,861
17	7,277	138	1,353	8,768	736	146	0	101	781	1,100	1,881	6,887
18	7,332	138	1,411	8,881	734	148	0	72	810	1,100	1,910	6,971
19	6,975	138	1,341	8,454	728	147	896	97	1,674	1,200	2,874	5,580
20	7,480	138	1,318	8,936	724	143	162	112	917	1,200	2,117	6,819
21	7,834	138	1,312	9,284	751	150	400	134	1,167	1,200	2,367	6,917
22	8,366	138	1,358	9,862	1,286	156	406	126	1,722	1,200	2,922	6,940
23	8,028	138	1,364	9,530	1,241	155	11	50	1,357	1,300	2,657	6,873
24	8,005	138	1,551	9,694	968	151	411	25	1,505	1,300	2,805	6,889
25	8,013	138	2,292	10,443	967	146	361	79	1,395	1,300	2,695	7,748
26	7,527	138	2,760	10,425	916	142	157	141	1,074	1,300	2,374	8,051
27	8,322	138	3,230	11,690	1,323	138	0	39	1,422	1,400	2,822	8,868
28	8,819	138	3,579	12,536	1,670	113	504	66	2,221	1,400	3,621	8,915
29	9,626	138	3,695	13,459	1,668	146	1,240	75	2,979	1,400	4,379	9,080
30	9,483	138	3,273	12,894	1,686	160	992	0	2,838	1,500	4,338	8,556
TOTAL	252,136	4,140	55,534	311,810	46,778	4,232	9,622	2,466	58,166	31,600	89,766	222,044
AVERAGE	8,405	138	1,851	10,394	1,559	141	321	82	1,939	1,053	2,992	7,401

Appendix 7. Delta Outflow (in CFS), January 1994 - July 1994

MAY 1994

DATE	SACRAMENTO RIVER AT FREEPORT	SACRAMENTO TREATMENT PLANT	SAN JOAQUIN RIVER NEAR VERNALIS	TOTAL COLUMNS 1, 2 & 3	TRACY PUMP	CONTRA COSTA PUMP	CLIFTON COURT FOREBAY INFLOW	BYRON-BETHANY IRRIGATION DIST.	TOTAL EXPORT	NET CONSUMPTIVE USE	TOTAL DEMAND	TOTAL OUTFLOW INDEX
1	9,178	138	2,556	11,872	1,666	164	47	76	1,801	1,500	3,301	8,571
2	8,469	138	2,069	10,676	1,234	159	248	76	1,565	1,500	3,065	7,611
3	7,727	138	1,789	9,654	886	155	0	75	966	1,500	2,466	7,188
4	8,060	138	1,664	9,862	922	152	323	79	1,318	1,600	2,918	6,944
5	8,024	138	1,545	9,707	1,014	147	198	63	1,296	1,600	2,896	6,811
6	8,099	138	1,447	9,684	958	145	50	44	1,109	1,600	2,709	6,975
7	7,916	138	1,957	10,011	866	140	300	15	1,291	1,700	2,991	7,020
8	9,134	138	2,657	11,929	835	136	2,150	76	3,045	1,700	4,745	7,184
9	9,336	138	2,880	12,354	953	134	1,377	11	2,453	1,700	4,153	8,201
10	11,036	138	2,824	13,998	1,027	138	1,409	29	2,545	1,800	4,345	9,653
11	11,397	138	2,824	14,359	1,033	151	549	49	1,684	1,800	3,484	10,875
12	10,802	138	2,649	13,589	1,036	161	637	71	1,763	1,800	3,563	10,026
13	10,436	138	2,211	12,785	1,024	163	766	81	1,872	1,900	3,772	9,013
14	9,606	138	1,876	11,620	1,013	157	434	76	1,528	1,900	3,428	8,192
15	9,268	138	1,697	11,103	1,013	159	98	76	1,194	1,900	3,094	8,009
16	10,119	138	1,594	11,851	1,015	156	849	94	1,926	2,000	3,926	7,925
17	9,479	138	1,477	11,094	1,014	147	0	26	1,135	2,000	3,135	7,959
18	9,252	138	1,441	10,831	1,014	146	399	76	1,483	2,000	3,483	7,348
19	8,377	138	1,620	10,135	984	139	0	69	1,054	2,100	3,154	6,981
20	8,113	138	2,255	10,506	969	128	599	60	1,636	2,100	3,736	6,770
21	7,793	138	2,517	10,448	976	122	749	33	1,814	2,100	3,914	6,534
22	7,754	138	2,556	10,448	969	119	834	53	1,869	2,200	4,069	6,379
23	8,157	138	2,533	10,828	994	127	798	77	1,842	2,200	4,042	6,786
24	8,325	138	2,255	10,718	926	124	1,891	135	2,806	2,200	5,006	5,712
25	7,930	138	2,013	10,081	839	127	0	76	890	2,300	3,190	6,891
26	7,723	138	1,710	9,571	852	161	1,970	92	2,891	2,300	5,191	4,380
27	7,738	138	1,441	9,317	1,199	181	1,875	93	3,162	2,300	5,462	3,855
28	8,676	138	1,347	10,161	1,765	183	1,497	93	3,352	2,400	5,752	4,409
29	8,431	138	1,306	9,875	1,767	181	1,800	73	3,675	2,400	6,075	3,800
30	7,780	138	1,278	9,196	2,370	183	56	93	2,516	2,500	5,016	4,180
31	6,850	138	1,193	8,181	1,684	187	0	139	1,732	2,500	4,232	3,949
TOTAL	270,985	4,278	61,181	336,444	34,817	4,672	21,903	2,179	59,213	61,100	120,313	216,131
AVERAGE	8,741	138	1,974	10,853	1,123	151	707	70	1,910	1,971	3,881	6,972

Appendix 7. Delta Outflow (in CFS), January 1994 - July 1994

JUNE 1994

DATE	SACRAMENTO RIVER AT FREEPORT	SACRAMENTO TREATMENT PLANT	SAN JOAQUIN RIVER NEAR VERNALIS	TOTAL COLUMNS 1, 2 & 3	TRACY PUMP	CONTRA COSTA PUMP	CLIFTON COURT FOREBAY INFLOW	BYRON-BETHANY IRRIGATION DIST.	TOTAL EXPORT	NET CONSUMPTIVE USE	TOTAL DEMAND	TOTAL OUTFLOW INDEX
1	6,660	215	1,159	8,034	899	155	652	167	1,539	2,500	4,039	3,995
2	7,470	215	1,165	8,850	893	190	1,398	126	2,355	2,600	4,955	3,895
3	7,155	215	1,094	8,464	795	191	943	152	1,777	2,600	4,377	4,087
4	7,582	215	1,068	8,865	719	194	998	151	1,760	2,700	4,460	4,405
5	7,544	215	1,052	8,811	718	194	978	151	1,739	2,700	4,439	4,372
6	6,503	215	1,089	7,807	724	190	0	73	841	2,800	3,641	4,166
7	6,223	215	1,046	7,484	718	198	0	160	756	2,800	3,556	3,928
8	6,688	215	1,004	7,907	705	213	200	167	951	2,800	3,751	4,156
9	6,704	215	978	7,897	724	213	104	185	856	2,900	3,756	4,141
10	7,395	215	1,094	8,704	693	222	757	151	1,521	2,900	4,421	4,283
11	7,391	215	1,116	8,722	826	225	400	160	1,291	3,000	4,291	4,431
12	7,391	215	1,110	8,716	766	215	0	141	840	3,000	3,840	4,876
13	7,870	215	1,084	9,169	795	217	954	131	1,835	3,100	4,935	4,234
14	7,990	215	1,057	9,262	1,318	202	421	132	1,809	3,100	4,909	4,353
15	7,946	215	989	9,150	1,628	190	342	145	2,015	3,200	5,215	3,935
16	7,388	215	973	8,576	1,627	190	0	161	1,656	3,200	4,856	3,720
17	7,443	215	1,026	8,684	1,621	199	0	135	1,685	3,300	4,985	3,699
18	7,800	215	1,127	9,142	1,614	205	429	126	2,122	3,300	5,422	3,720
19	8,346	215	1,159	9,720	1,620	201	833	151	2,503	3,400	5,903	3,817
20	8,726	215	1,176	10,117	2,035	204	290	77	2,452	3,500	5,952	4,165
21	9,009	215	1,127	10,351	2,506	213	0	118	2,601	3,500	6,101	4,250
22	9,169	215	1,116	10,500	2,097	206	381	104	2,580	3,500	6,080	4,420
23	8,752	215	1,170	10,137	1,854	204	0	140	1,918	3,600	5,518	4,619
24	8,953	215	1,036	10,204	1,752	208	160	158	1,962	3,600	5,562	4,642
25	9,212	215	1,105	10,532	1,700	211	600	129	2,382	3,700	6,082	4,450
26	9,029	215	1,204	10,448	1,698	210	450	140	2,218	3,700	5,918	4,530
27	9,645	215	1,198	11,058	1,700	215	1,356	114	3,157	3,800	6,957	4,101
28	9,335	215	1,094	10,644	1,696	222	991	115	2,794	3,800	6,594	4,050
29	9,310	215	1,078	10,603	1,698	236	806	122	2,618	3,800	6,418	4,185
30	9,014	215	994	10,223	1,700	234	495	141	2,288	3,900	6,188	4,035
31												
TOTAL	239,643	6,450	32,688	278,781	39,839	6,167	14,938	4,123	56,821	96,300	153,121	125,660
AVERAGE	7,988	215	1,090	9,293	1,328	206	498	137	1,894	3,210	5,104	4,189

Appendix 7. Delta Outflow (in CFS), January 1994 - July 1994

JULY 1994

DATE	SACRAMENTO RIVER AT FREEPORT	SACRAMENTO TREATMENT PLANT	SAN JOAQUIN RIVER NEAR VERNALIS	TOTAL COLUMNS 1, 2 & 3	TRACY PUMP	CONTRA COSTA PUMP	CLIFTON COURT FOREBAY INFLOW	BYRON-BETHANY IRRIGATION DIST.	TOTAL EXPORT	NET CONSUMPTIVE USE	TOTAL DEMAND	TOTAL OUTFLOW INDEX
1	9,412	215	989	10,616	1,772	223	785	93	2,687	4,000	6,687	3,929
2	9,711	215	932	10,858	1,809	224	768	76	2,725	4,000	6,725	4,133
3	8,976	215	952	10,143	1,813	223	0	76	1,960	4,000	5,960	4,183
4	9,896	215	1,068	11,179	1,816	211	0	76	1,951	4,100	6,051	5,128
5	9,690	215	1,057	10,962	1,815	210	403	91	2,337	4,100	6,437	4,525
6	9,878	215	1,121	11,214	1,254	205	905	76	2,288	4,100	6,388	4,826
7	10,260	198	1,100	11,558	1,012	213	1,249	99	2,375	4,100	6,475	5,083
8	10,816	198	1,004	12,018	1,408	213	1,293	122	2,792	4,200	6,992	5,026
9	13,162	198	989	14,349	2,432	213	2,654	58	5,241	4,200	9,441	4,908
10	14,885	198	937	16,020	3,368	216	2,718	76	6,226	4,200	10,426	5,594
11	15,036	198	994	16,228	3,699	214	2,893	82	6,724	4,300	11,024	5,204
12	14,661	198	892	15,751	3,943	224	2,272	94	6,345	4,300	10,645	5,106
13	14,204	198	907	15,309	4,245	217	2,039	83	6,418	4,300	10,718	4,591
14	14,183	198	897	15,278	4,314	218	2,487	142	6,877	4,300	11,177	4,101
15	13,825	198	942	14,965	4,272	223	2,093	96	6,492	4,400	10,892	4,073
16	13,562	198	927	14,687	3,878	217	1,981	96	5,980	4,400	10,380	4,307
17	13,837	198	907	14,942	3,655	218	2,613	96	6,390	4,400	10,790	4,152
18	13,400	198	989	14,587	3,681	216	2,298	37	6,158	4,400	10,558	4,029
19	12,585	198	1,010	13,793	3,198	215	1,495	99	4,809	4,500	9,309	4,484
20	11,711	198	1,031	12,940	2,331	215	1,016	66	3,476	4,500	7,976	4,964
21	11,352	198	1,182	12,732	2,007	212	1,193	72	3,340	4,500	7,840	4,892
22	11,038	198	1,260	12,496	2,028	222	1,205	66	3,387	4,500	7,887	4,609
23	10,943	198	1,353	12,494	2,005	225	1,300	93	3,437	4,500	7,937	4,557
24	11,032	198	1,453	12,683	1,996	228	1,352	76	3,500	4,600	8,100	4,583
25	11,393	198	1,563	13,154	2,001	206	1,857	76	3,988	4,600	8,588	4,566
26	11,085	198	1,545	12,828	1,997	212	2,099	25	4,283	4,600	8,883	3,945
27	10,894	198	1,551	12,643	1,992	210	2,390	74	4,518	4,600	9,118	3,525
28	10,709	198	1,538	12,445	2,036	205	2,694	80	4,855	4,600	9,455	2,990
29	11,004	198	1,465	12,667	2,036	215	3,423	83	5,591	4,600	10,191	2,476
30	10,868	198	1,370	12,436	2,030	211	3,150	61	5,330	4,600	9,930	2,506
31	10,199	198	1,204	11,601	2,036	209	1,781	50	3,976	4,600	8,576	3,025
TOTAL	364,207	6,240	35,129	405,576	77,877	6,683	54,406	2,510	136,456	135,100	271,556	134,020
AVERAGE	11,749	201	1,133	13,083	2,512	216	1,755	81	4,402	4,358	8,760	4,323

APPENDIX 8. EAST BAY MUNICIPAL UTILITY DISTRICT
PASSIVE-INTEGRATED TRANSPONDER DATA FOR JUVENILE CHINOOK SALMON

TRANSPONDER LOT NUMBER	TRANSPONDER TAG ID NUMBER	TAGGING DATE	RELEASE DATE	RELEASE TIME	RELEASE LOCATION	RECOVERY LOCATION	RECOVERY DATE	RECOVERY TIME	AFTER RECOVERY (MM)	AFTER RECOVERY (MM)	WEIGHT (GRAMS)	RECOVERY INFORMATION	ELAPSED DAYS
27647	007545033	7/9/94 (U)	07/18/94	21:15	250 FT U/S DAM (RM 38.7)	UPPER LADDER	08/01/94	06:00	121	111	15.5	RELEASE 1	13.36
27655	008595064	7/9/94 (U)	07/18/94	21:15	250 FT U/S DAM (RM 38.7)	UPPER LADDER	07/25/94	08:30	119	109	12.2	RELEASE 1	6.47
27653	008638039	7/9/94 (U)	07/18/94	21:15	250 FT U/S DAM (RM 38.7)	UPPER LADDER	07/29/94	08:45	108	98	9.5	RELEASE 1	10.46
27640	008637105	7/9/94 (U)	07/18/94	21:15	250 FT U/S DAM (RM 38.7)	LOWER LADDER	07/20/94	10:25	131	122	19.9	RELEASE 1	1.55
18790	008523872	7/10/94 (U)	07/18/94	21:15	250 FT U/S DAM (RM 38.7)	LOWER LADDER	07/19/94	08:00	113	107		RELEASE 1	0.45
18787	008868092	7/10/94 (U)	07/18/94	21:15	250 FT U/S DAM (RM 38.7)	LOWER LADDER	07/20/94	15:50	106	98	9.5	RELEASE 1	1.77
18791	005275284	7/10/94 (U)	07/18/94	21:15	250 FT U/S DAM (RM 38.7)	LOWER LADDER	07/20/94	10:25	125	115	16.9	RELEASE 1	1.55
27647	007585537	7/9/94 (U)	07/18/94	21:15	250 FT U/S DAM (RM 38.7)	LOWER LADDER	07/23/94	16:10	122	114	15.3	RELEASE 1	4.79
18811	007080301	7/10/94 (U)	07/18/94	21:15	250 FT U/S DAM (RM 38.7)	LOWER LADDER	07/20/94	10:25	105	96	9.2	RELEASE 1	1.55
27648	008548119	7/9/94 (U)	07/18/94	21:15	250 FT U/S DAM (RM 38.7)	LOWER LADDER	07/21/94	08:15	110	103	10.8	RELEASE 1	2.46
27662	008638553	7/9/94 (U)	07/18/94	21:15	250 FT U/S DAM (RM 38.7)	LOWER LADDER	07/20/94	10:25	112	105	12.7	RELEASE 1	1.55
27643	007090604	7/9/94 (U)	07/18/94	21:15	250 FT U/S DAM (RM 38.7)	LOWER LADDER	07/19/94	08:00	127	117		RELEASE 1	0.45
27661	008015587	7/9/94 (U)	07/18/94	21:15	250 FT U/S DAM (RM 38.7)	LOWER LADDER	07/20/94	15:50	111	104	11.1	RELEASE 1	1.77
27642	007051258	7/9/94 (U)	07/18/94	21:15	250 FT U/S DAM (RM 38.7)	LOWER LADDER	07/19/94	08:00	120	115		RELEASE 1	0.45
18778	008575321	7/10/94 (U)	07/18/94	21:15	250 FT U/S DAM (RM 38.7)	LOWER LADDER	07/21/94	08:15	120	112	13.4	RELEASE 1	2.46
18811	007088339	7/10/94 (U)	07/18/94	21:15	250 FT U/S DAM (RM 38.7)	LOWER LADDER	07/20/94	10:25	116	108	14.2	RELEASE 1	1.55
18811	007357372	7/10/94 (U)	07/18/94	21:15	250 FT U/S DAM (RM 38.7)	LOWER LADDER	07/21/94	08:15	99	92	7.7	RELEASE 1	2.46
18787	006875024	7/10/94 (U)	07/18/94	21:15	250 FT U/S DAM (RM 38.7)	LOWER LADDER	07/20/94	10:25	116	107	13.8	RELEASE 1	1.55
27653	007862343	7/9/94 (U)	07/18/94	21:15	250 FT U/S DAM (RM 38.7)	LOWER LADDER	07/20/94	10:25	129	119	17.6	RELEASE 1	1.55
18780	006319771	7/10/94 (U)	07/18/94	21:15	250 FT U/S DAM (RM 38.7)	LOWER LADDER	07/19/94	08:00	117	109		RELEASE 1	0.45
27662	007290076	7/9/94 (U)	07/18/94	21:15	250 FT U/S DAM (RM 38.7)	LOWER LADDER	07/20/94	10:25	125	115	16.2	RELEASE 1	1.55
27651	007868537	7/9/94 (U)	07/18/94	21:00	WID SCREENS (RM 39.0)	UPPER LADDER	07/21/94	09:00	116	107	12.2	RELEASE 2	2.50
27644	007851625	7/9/94 (U)	07/18/94	21:15	WID SCREENS (RM 39.0)	UPPER LADDER	07/26/94	09:20	119	108	13.8	RELEASE 2	7.50
18775	007584337	7/10/94 (U)	07/18/94	21:05	WID SCREENS (RM 39.0)	UPPER LADDER	07/23/94	08:30	127	117	17.2	RELEASE 2	4.48
27657	008771019	7/9/94 (U)	07/18/94	21:00	WID SCREENS (RM 39.0)	LOWER LADDER	07/19/94	08:00	115	108		RELEASE 2	0.46
27662	007121065	7/9/94 (U)	07/18/94	21:05	WID SCREENS (RM 39.0)	LOWER LADDER	07/19/94	08:00	103	96		RELEASE 2	0.45
18775	007328526	7/10/94 (U)	07/18/94	21:15	WID SCREENS (RM 39.0)	LOWER LADDER	07/19/94	08:00	132	124		RELEASE 2	0.45
18779	007124038	7/10/94 (U)	07/18/94	21:05	WID SCREENS (RM 39.0)	LOWER LADDER	07/19/94	08:00	107	100		RELEASE 2	0.45
18813	006274782	7/10/94 (U)	07/18/94	21:15	WID SCREENS (RM 39.0)	LOWER LADDER	07/19/94	08:00	100	95		RELEASE 2	0.45
18813	006602365	7/10/94 (U)	07/18/94	21:00	WID SCREENS (RM 39.0)	LOWER LADDER	07/19/94	08:00	127	118		RELEASE 2	0.46
27656	007777370	7/9/94 (U)	07/18/94	21:00	WID SCREENS (RM 39.0)	LOWER LADDER	07/19/94	08:00	95	90		RELEASE 2	0.46
18775	006794881	7/10/94 (U)	07/18/94	21:15	WID SCREENS (RM 39.0)	LOWER LADDER	07/19/94	08:00	108	101		RELEASE 2	0.45
27656	007091032	7/9/94 (U)	07/18/94	21:05	WID SCREENS (RM 39.0)	LOWER LADDER	07/19/94	08:00	117	110		RELEASE 2	0.45
18785	007603365	7/10/94 (U)	07/18/94	21:05	WID SCREENS (RM 39.0)	LOWER LADDER	07/29/94	08:25	116	108	13.1	RELEASE 2	10.47
27643	007026602	7/9/94 (U)	07/18/94	21:00	WID SCREENS (RM 39.0)	LOWER LADDER	07/20/94	10:25	118	110	14	RELEASE 2	1.56
27645	007560779	7/9/94 (U)	07/18/94	21:05	WID SCREENS (RM 39.0)	LOWER LADDER	07/19/94	08:00	110	103		RELEASE 2	0.45
27643	006783537	7/9/94 (U)	07/18/94	21:00	WID SCREENS (RM 39.0)	LOWER LADDER	07/19/94	08:00	113	104		RELEASE 2	0.46
27640	008373598	7/9/94 (U)	07/18/94	21:00	WID SCREENS (RM 39.0)	LOWER LADDER	07/24/94	08:30	115	106	12.6	RELEASE 2	5.48
27663	007575387	7/9/94 (U)	07/18/94	21:00	WID SCREENS (RM 39.0)	LOWER LADDER	07/19/94	08:00	130	123		RELEASE 2	0.46
18788	007025883	7/10/94 (U)	07/18/94	21:15	WID SCREENS (RM 39.0)	LOWER LADDER	07/19/94	08:00	116	110		RELEASE 2	0.45
18789	007339016	7/10/94 (U)	07/18/94	21:00	WID SCREENS (RM 39.0)	LOWER LADDER	07/19/94	08:00	123	115		RELEASE 2	0.46
27654	007567811	7/9/94 (U)	07/18/94	21:00	WID SCREENS (RM 39.0)	LOWER LADDER	07/19/94	08:00	105	98		RELEASE 2	0.46
27657	007563831	7/9/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	UPPER LADDER	07/24/94	08:50	119	110	14.4	RELEASE 3	4.48
18785	007607041	7/10/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	UPPER LADDER	07/25/94	08:30	111	102	11.3	RELEASE 3	5.47
27647	008803050	7/9/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	UPPER LADDER	07/27/94	09:10	113	105	13	RELEASE 3	7.50
18776	008857610	7/10/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	UPPER LADDER	07/23/94	08:30	119	110	13.4	RELEASE 3	3.47
18773	008833839	7/10/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	UPPER LADDER	07/23/94	08:30	115	105	11.8	RELEASE 3	3.47
18776	007594362	7/10/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	UPPER LADDER	08/01/94	10:00				RELEASE 3	12.53
27652	008377082	7/9/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/20/94	10:25	118	106	13.8	RELEASE 3	0.55
18779	008854858	7/10/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	107	99	11.6	RELEASE 3	1.46
27642	007588316	7/9/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/20/94	15:50	102	95	8.9	RELEASE 3	0.77
27655	007627127	7/9/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	121	111	15.7	RELEASE 3	1.45
27666	007874523	7/9/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	116	107	13.2	RELEASE 3	1.45
18813	006358538	7/10/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/20/94	15:50	105	97	9.4	RELEASE 3	0.77
18776	006357260	7/10/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/20/94	10:25	113	105	12.3	RELEASE 3	0.55
27652	008115080	7/9/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/20/94	15:50	110	103	12	RELEASE 3	0.77
27645	007034115	7/9/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	103	95	8.5	RELEASE 3	1.46
27642	008620829	7/9/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	122	114	15.9	RELEASE 3	1.46
18792	008324790	7/10/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/20/94	10:25	99	91	8.1	RELEASE 3	0.55
18786	008316383	7/10/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	110	101	11.1	RELEASE 3	1.46
27650	008354798	7/9/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	119	109	11	RELEASE 3	1.46
27649	007289844	7/9/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	110	102	11.5	RELEASE 3	1.46
27648	007833566	7/9/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	110	101	11.6	RELEASE 3	1.46
18779	006777262	7/10/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	112	104	11.7	RELEASE 3	1.46
18782	006821027	7/10/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/28/94	08:25	111	103	11.4	RELEASE 3	8.47
27663	006844047	7/9/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/20/94	10:25	109	100	11	RELEASE 3	0.55
18783	007360588	7/10/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	124	115	15.6	RELEASE 3	1.46
27664	008373046	7/9/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	106	99	10.4	RELEASE 3	1.46
27648	008127080	7/9/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	104	96	8.6	RELEASE 3	1.46
27651	006605806	7/9/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/20/94	10:25	114	105	13.7	RELEASE 3	0.55

APPENDIX 8. EAST BAY MUNICIPAL UTILITY DISTRICT
PASSIVE-INTEGRATED TRANSPONDER DATA FOR JUVENILE CHINOOK SALMON

TRANSPONDER LOT NUMBER	TRANSPONDER TAG ID NUMBER	TAGGING DATE	RELEASE DATE	RELEASE TIME	RELEASE LOCATION	RECOVERY LOCATION	RECOVERY DATE	RECOVERY TIME	AFTER RECOVERY (MM)	AFTER RECOVERY (MM)	WEIGHT (GRAMS)	RECOVERY INFORMATION	ELAPSED DAYS
27659	007624081	7/9/94 (U)	07/19/94	21:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	115	105	12.3	RELEASE 3	1.46
18780	007347786	7/10/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	UPPER LADDER	07/20/94	10:30	110	100	11.3	RELEASE 4	0.56
27658	008827054	7/9/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	UPPER LADDER	07/24/94	08:50	119	110	12.6	RELEASE 4	4.49
27668	008296574	7/9/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	UPPER LADDER	07/30/94	15:40	117	107	14.5	RELEASE 4	10.78
27650	007783512	7/9/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	UPPER LADDER	07/28/94	16:00	117	109	13.3	RELEASE 4	8.79
18773	007030883	7/10/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	UPPER LADDER	07/25/94	08:30	101	94	8.5	RELEASE 4	5.48
18789	007122546	7/10/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	UPPER LADDER	07/24/94	08:50	117	108	13.9	RELEASE 4	4.49
27667	007105265	7/9/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	UPPER LADDER	07/21/94	09:00	91	84	6.7	RELEASE 4	1.50
18780	007588001	7/10/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	UPPER LADDER	07/24/94	14:15	115	106	13	RELEASE 4	4.72
27663	008569629	7/9/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	LOWER LADDER	07/21/94	08:15	115	107	13	RELEASE 4	1.47
27654	007121893	7/9/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	LOWER LADDER	07/20/94	15:50	125	115	16.7	RELEASE 4	0.78
18787	007585109	7/10/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	LOWER LADDER	07/20/94	10:25	110	100	12.1	RELEASE 4	0.56
27658	007127845	7/9/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	LOWER LADDER	07/20/94	10:25	115	107	13.5	RELEASE 4	0.56
27650	008621256	7/9/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	LOWER LADDER	07/20/94	15:50	101	94	9.1	RELEASE 4	0.78
18774	007025595	7/10/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	LOWER LADDER	07/21/94	08:15	110	103	11.9	RELEASE 4	1.47
18775	006794053	7/10/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	LOWER LADDER	07/21/94	08:15	116	106	12.1	RELEASE 4	1.47
18811	006884801	7/10/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	LOWER LADDER	07/21/94	16:10	115	107	12.7	RELEASE 4	1.80
18776	006278872	7/10/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	LOWER LADDER	07/21/94	08:15	119	107	15.1	RELEASE 4	1.47
27650	008525354	7/9/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	LOWER LADDER	07/21/94	08:15	103	95	9	RELEASE 4	1.47
27644	007331819	7/9/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	LOWER LADDER	07/21/94	08:15	113	105	12.3	RELEASE 4	1.47
27661	008594000	7/9/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	LOWER LADDER	07/20/94	15:50	114	105	13.2	RELEASE 4	0.78
27662	006607840	7/9/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	LOWER LADDER	07/20/94	15:50	106	99	11	RELEASE 4	0.78
18813	006591063	7/10/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	LOWER LADDER	07/21/94	16:10	107	99	10.4	RELEASE 4	1.80
18783	006551587	7/10/94 (U)	07/19/94	21:05	CONCRETE PAD (RM 40.75)	LOWER LADDER	07/20/94	15:50	117	109	15.8	RELEASE 4	0.78
18781	007031011	7/10/94 (U)	07/19/94	21:00	CONCRETE PAD (RM 40.75)	LOWER LADDER	07/21/94	08:15	110	103	12.5	RELEASE 4	1.47
27647	007839318	7/9/94 (U)	07/20/94	12:30	RAIL ROAD BRIDGE (RM 42.1)	UPPER LADDER	07/29/94	08:45	117	108	13.6	RELEASE 5	8.84
27643	006572603	7/9/94 (U)	07/20/94	12:30	RAIL ROAD BRIDGE (RM 42.1)	UPPER LADDER	07/24/94	08:50	117	108	14	RELEASE 5	3.85
27644	006607060	7/9/94 (U)	07/20/94	12:30	RAIL ROAD BRIDGE (RM 42.1)	UPPER LADDER	07/30/94	15:40	111	102	12.1	RELEASE 5	10.13
18788	006111604	7/10/94 (U)	07/20/94	12:30	RAIL ROAD BRIDGE (RM 42.1)	UPPER LADDER	07/25/94	08:30	115	106	12.8	RELEASE 5	4.83
27641	008584892	7/9/94 (U)	07/20/94	12:30	RAIL ROAD BRIDGE (RM 42.1)	UPPER LADDER	07/30/94	15:40	122	112	14.2	RELEASE 5	10.13
27645	008770591	7/9/94 (U)	07/20/94	12:30	RAIL ROAD BRIDGE (RM 42.1)	UPPER LADDER	07/23/94	08:30	115	107	12.8	RELEASE 5	2.83
18781	007572316	7/10/94 (U)	07/20/94	12:30	RAIL ROAD BRIDGE (RM 42.1)	UPPER LADDER	07/24/94	08:50	121	113	14.2	RELEASE 5	3.85
27648	008100578	7/9/94 (U)	07/20/94	12:30	RAIL ROAD BRIDGE (RM 42.1)	UPPER LADDER	07/23/94	08:30	112	104	12	RELEASE 5	2.83
18789	006350770	7/10/94 (U)	07/20/94	12:30	RAIL ROAD BRIDGE (RM 42.1)	UPPER LADDER	07/24/94	08:50	122	117	15.7	RELEASE 5	3.85
18785	002018026	7/10/94 (U)	07/20/94	12:30	RAIL ROAD BRIDGE (RM 42.1)	UPPER LADDER	07/24/94	08:50	120	108	13.2	RELEASE 5	3.85
18782	006550567	7/10/94 (U)	07/20/94	12:30	RAIL ROAD BRIDGE (RM 42.1)	LOWER LADDER	07/22/94	08:15	122	112	14.5	RELEASE 5	1.82
27656	008369124	7/9/94 (U)	07/20/94	12:30	RAIL ROAD BRIDGE (RM 42.1)	LOWER LADDER	07/22/94	08:15	100	92	8	RELEASE 5	1.82
27646	008122370	7/9/94 (U)	07/20/94	12:30	RAIL ROAD BRIDGE (RM 42.1)	LOWER LADDER	07/22/94	08:15	92	85	6.5	RELEASE 5	1.82
18775	006365052	7/10/94 (U)	07/20/94	12:30	RAIL ROAD BRIDGE (RM 42.1)	LOWER LADDER	07/30/94	16:00	124	114	15.1	RELEASE 5	10.15
18779	006859842	7/10/94 (U)	07/20/94	12:30	RAIL ROAD BRIDGE (RM 42.1)	LOWER LADDER	07/24/94	08:30	100	93	8.1	RELEASE 5	3.83
27646	008368014	7/9/94 (U)	07/20/94	12:30	RAIL ROAD BRIDGE (RM 42.1)	LOWER LADDER	07/21/94	08:15	110	103	11.7	RELEASE 5	0.82
18812	007581369	7/10/94 (U)	07/20/94	12:30	RAIL ROAD BRIDGE (RM 42.1)	LOWER LADDER	07/22/94	08:15	105	96	8.4	RELEASE 5	1.82
27645	008599876	7/9/94 (U)	07/20/94	12:30	RAIL ROAD BRIDGE (RM 42.1)	LOWER LADDER	07/23/94	08:50	97	90	7.7	RELEASE 5	2.85
18773	006376039	7/10/94 (U)	07/20/94	12:15	PARK GAZEBO (RM 39.7)	UPPER LADDER	07/24/94	08:50	113	104	11.9	RELEASE 6	3.86
18785	006859342	7/10/94 (U)	07/20/94	12:15	PARK GAZEBO (RM 39.7)	UPPER LADDER	07/28/94	08:40	114	105	13.3	RELEASE 6	7.85
27643	008556096	7/9/94 (U)	07/20/94	12:15	PARK GAZEBO (RM 39.7)	UPPER LADDER	07/23/94	08:30	117	109	13.9	RELEASE 6	2.84
27666	008383302	7/9/94 (U)	07/20/94	12:15	PARK GAZEBO (RM 39.7)	UPPER LADDER	07/24/94	14:15	114	105	13.2	RELEASE 6	4.08
18785	006526336	7/10/94 (U)	07/20/94	12:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/22/94	08:15	109	100	10.7	RELEASE 6	1.83
27644	006684298	7/9/94 (U)	07/20/94	12:15	PARK GAZEBO (RM 38.7)	LOWER LADDER	07/21/94	08:15	106	99	9.5	RELEASE 6	0.83
18781	007601811	7/10/94 (U)	07/20/94	12:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	109	100	10.6	RELEASE 6	0.83
18778	006381303	7/10/94 (U)	07/20/94	12:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	16:10	111	103	10.7	RELEASE 6	1.16
27666	008579539	7/9/94 (U)	07/20/94	12:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/27/94	16:08	114	107	12.1	RELEASE 6	7.16
18780	006600781	7/10/94 (U)	07/20/94	12:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	119	113	12.7	RELEASE 6	0.83
27659	008576109	7/9/94 (U)	07/20/94	12:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	104	96	9.7	RELEASE 6	0.83
18812	007330570	7/10/94 (U)	07/20/94	12:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	120	111	15.8	RELEASE 6	0.83
18787	007100622	7/10/94 (U)	07/20/94	12:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/23/94	08:50	123	113	15.3	RELEASE 6	2.86
27654	008297066	7/9/94 (U)	07/20/94	12:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	103	96	9.8	RELEASE 6	0.83
27653	007777834	7/9/94 (U)	07/20/94	12:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	107	98	9.5	RELEASE 6	0.83
18812	002026315	7/10/94 (U)	07/20/94	12:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	114	106	12.2	RELEASE 6	0.83
27651	008065102	7/9/94 (U)	07/20/94	12:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	115	107	12	RELEASE 6	0.83
18811	006778366	7/10/94 (U)	07/20/94	12:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/23/94	16:30	112	101	11.6	RELEASE 6	3.18
18783	007358110	7/10/94 (U)	07/20/94	12:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	120	112	15	RELEASE 6	0.83
27656	007108369	7/9/94 (U)	07/20/94	12:15	PARK GAZEBO (RM 39.7)	LOWER LADDER	07/21/94	08:15	113	105	12.1	RELEASE 6	0.83
27643	006805109	7/9/94 (U)	07/20/94	12:15	AT DAM (RM 38.6)	LOWER LADDER	07/29/94	08:25	98	89	7.5	RELEASE 7	8.84
18786	007282781	7/10/94 (U)	07/20/94	12:15	AT DAM (RM 38.6)	LOWER LADDER	07/24/94	14:30	104	95	9.3	RELEASE 7	4.09

Appendix 9. **Water quality parameters measured in Mokelumne River and Lake Lodi, May 26, 1994 through July 25, 1994.**

River Mile/ Depth	Date MMDDYY	Time HHMMSS	Temp degF	pH units	SpCond uS/cm	DO %Sat	DO mg/l	Redox mV
RM38.5	52694	134108	67.7	8.58	43.1	102.5	9.38	316
RM38.6-S	52694	135136	71.1	8.59	43.3	109.4	9.63	365
-3	52694	135233	69.5	8.52	43	108.9	9.76	371
-6	52694	135314	65.9	8.49	43.3	105.6	9.86	376
-9	52694	135351	65.5	8.46	43	105.1	9.85	379
-12	52694	135437	65.3	8.48	42.8	104.5	9.81	379
-15	52694	135520	65.1	8.45	42.3	103.5	9.74	382
RM39.0L-S	52694	135946	71.3	8.68	43.8	108	9.49	367
-3	52694	140052	67.2	8.58	43.1	108	9.93	376
-6	52694	140146	66.3	8.63	42.5	111.9	10.39	377
-9	52694	140227	66.3	8.6	42.7	109.5	10.17	379
RM39.0R-S	52694	140705	70.1	8.53	43.8	105	9.35	375
-3	52694	140737	66.6	8.49	43.3	104.8	9.7	380
-6	52694	140832	65.2	8.44	43.8	104	9.77	385
-9	52694	140903	65	8.43	43.6	103.1	9.71	387
-12	52694	140948	64.9	8.43	43.6	103.1	9.73	388
-15	52694	141019	64.8	8.44	43.5	103	9.72	389
RM39.9-S	52694	142124	71.2	8.54	43.5	108.7	9.56	381
-3	52694	142215	65.7	8.43	42.9	102.4	9.57	390
-6	52694	142248	64.4	8.41	42.8	102.8	9.75	392
-9	52694	142323	64	8.43	42.7	102.4	9.76	392
-12	52694	142358	64	8.43	42.6	102.3	9.75	393
RM40.75-S	52694	142951	66.5	8.31		107.8	9.99	394
-3	52694	143029	65	8.52	42.7	105.2	9.91	388
-6	52694	143116	64.4	8.5	42.6	104.6	9.92	391
-9	52694	143204	64.2	8.49	42.5	104.6	9.95	393
RM41.3-S	52694	143717	64.3	8.44	43.3	102.2	9.7	402
-3	52694	143753	64	8.41	43.3	102.2	9.74	403
-6	52694	143822	63.5	8.4	43.2	101.4	9.72	404
-9	52694	143913	63.1	8.42	43.2	101.5	9.77	404
RM42.3-S	52694	144503	61.9	8.48	41.9	98.4	9.6	395
-3	52694	144551	61.6	8.39	42.1	98	9.6	401
-6	52694	144656	61.6	8.34	41.9	98.3	9.63	404
-9	52694	144758	61.5	8.36	42.2	98.1	9.62	404
RM43.25-S	52694	145311	62.7	8.77		97.1	9.39	382
-3	52694	145405	61.4	8.49	41.3	99.4	9.76	396
-6	52694	145518	61.4	8.42	41.3	99.1	9.73	400

Appendix 9. Water quality parameters measured in Mokelumne River and Lake Lodi, May 26, 1994 through July 25, 1994.

River Mile/ Depth	Date MMDDYY	Time HHMMSS	Temp degF	pH units	SpCond uS/cm	DO %Sat	DO mg/l	Redox mV
RM38.5	53194	145231	67.7	8.49	43.1	102.2	9.35	337
RM38.6-S	53194	150243	64.1	8.15		119.1	11.34	372
-3	53194	150351	67.2	8.34	43	102.3	9.4	365
-6	53194	150437	65.4	8.3	42.9	100.9	9.46	371
-9	53194	150515	64.8	8.27	42.8	99.7	9.41	374
-12	53194	150606	64.6	8.27	42.9	99.6	9.42	377
-15	53194	150643	64.5	8.27	42.7	99.8	9.45	378
RM39.0R-S	53194	151347	70.6	8.84		104.7	9.28	
-3	53194	151422	66.9	8.39	43.1	101.7	9.38	386
-6								
-9	53194	151530	64.2	8.27	42.6	99.1	9.43	394
-12	53194	151557	64	8.27	42.8	98.8	9.41	395
-15	53194	151647	64	8.26	42.6	99.1	9.44	395
RM39.0L-S	53194	152107	71.1	8.54	43.8	109.9	9.68	375
-3	53194	152137	68.6	8.47	42.9	109.7	9.93	379
-6	53194	152205	66.6	8.46	42.5	108.9	10.08	382
-9	53194	152237	65.9	8.51	42.8	108.6	10.12	381
RM39.9-S	53194	152947	65.8	8.84		102.4	9.55	326
	53194	152959	66.3	8.5		103.5	9.61	368
-3	53194	153029	65	8.35	42.3	101.5	9.57	387
-6	53194	153057	64.2	8.3	42.3	100.2	9.53	391
-9	53194	153115	63.7	8.28	42.1	100.1	9.58	392
RM40.75-S	53194	153924	65.5	8.39	42.9	104.1	9.76	382
-3	53194	153946	64.7	8.36	42.8	103.3	9.76	385
	53194	153956	64.7	8.36	42.9	102.6	9.7	385
-6	53194	154016	63	8.34	42.9	102.2	9.85	387
RM41.3-S	53194	162532	63.3	8.64	39.6	101.2	9.71	410
-3	53194	162602	62.3	8.42	42.5	100	9.72	419
	53194	162620	62.3	8.38	42.6	100.3	9.75	421
-6	53194	162649	61.2	8.34	42.5	98.3	9.68	422
-9	53194	162733	61.2	8.31	42.4	99.2	9.77	423
RM42.3-S	53194	163919	61.1	8.38		99.4	9.79	396
-3	53194	163952	60.8	8.37	41.8	99.3	9.82	398
-6	53194	164029	60.8	8.32	41.8	98.3	9.73	401
-9	53194	164109	60.8	8.3	41.6	96.1	9.5	402
RM43.25-S	53194	165547	61.5	8.52	39.7	102.9	10.1	421
-3	53194	165612	61.5	8.46	41.8	104.3	10.23	424
-6	53194	165641	61.4	8.42	41.8	105.8	10.38	426
-9	53194	165716	61.4	8.42	41.7	103.9	10.2	425

Appendix 9. Water quality parameters measured in Mokelumne River and Lake Lodi, May 26, 1994 through July 25, 1994.

River Mile/ Depth	Date MMDDYY	Time HHMMSS	Temp degF	pH units	SpCond uS/cm	DO %Sat	DO mg/l	Redox mV
RM38.5	60794	135327	64.4	8.62	43.4	102.8	9.75	346
RM38.6-S	60794	140430	67.7	9.28	43.3	118.6	10.83	353
-3	60794	140546	63.8	8.62	43.1	103	9.84	382
-6	60794	140632	63	8.49	43	102.1	9.85	389
-9	60794	140718	62.8	8.46	43.2	102.1	9.86	392
-12	60794	140801	62.7	8.44	42.9	101.9	9.85	394
-15	60794	140914	62.6	8.44	42.8	102.3	9.91	396
RM39.0L-S	60794	141406	68.8	8.75	41.2	113.1	10.21	379
-3	60794	141500	66.6	8.61	43.7	107.1	9.91	388
-6	60794	141538	63.8	8.51	42.9	105.9	10.11	394
RM39.0R-S	60794	142024	67.7	8.58	43.5	108.1	9.89	388
-3	60794	142101	65.8	8.47	43.2	104.8	9.78	395
-6	60794	142156	63	8.42	42.8	102.7	9.9	399
-9	60794	142240	62.5	8.39	42.4	101.6	9.85	402
-12	60794	142314	62.4	8.39	42.7	101.7	9.87	403
-15	60794	142359	62.3	8.38	43	101.6	9.87	404
RM39.9-S	60794	142851	64.3	8.54	43.1	103.1	9.79	392
-3	60794	142928	63.5	8.45	42.9	102.7	9.84	397
-6	60794	143019	62.7	8.42	42.7	101.9	9.86	400
-9	60794	143051	62.3	8.41	42.7	101.7	9.89	402
-12	60794	143123	62.3	8.4	42.5	101.9	9.9	403
RM40.75-S	60794	143701	64.8	8.69	43.5	106.9	10.1	388
-3	60794	143729	64.4	8.58	43.5	105.7	10.02	394
-6	60794	143802	63.1	8.53	43.4	105.3	10.14	397
-9	60794	143839	62.3	8.51	43.1	105.3	10.24	400
RM41.3-S	60794	144541	62.8	8.66	42.8	103.4	9.99	389
-3	60794	144628	62.1	8.51	42.8	102.8	10.02	397
-6	60794	144706	61.4	8.42	42.8	101.9	10.01	402
-9	60794	144737	61.3	8.43	42.5	102.2	10.05	403
RM42.3-S	60794	145640	60.9	8.51	42.2	99.5	9.83	397
-3	60794	145710	60.9	8.42	42.1	99.7	9.85	402
-6	60794	145741	60.8	8.37	42.2	99.7	9.86	404
-9	60794	145816	60.8	8.36	41.8	99.6	9.85	405
RM43.25-S	60794	150310	60.9	8.56	42	101.8	10.05	397
-3	60794	150340	60.9	8.48	42.1	101.9	10.06	400
-6	60794	150416	60.8	8.43	42	102	10.08	403

Appendix 9. Water quality parameters measured in Mokelumne River and Lake Lodi, May 26, 1994 through July 25, 1994.

River Mile/ Depth	Date MMDDYY	Time HHMMSS	Temp degF	pH units	SpCond uS/cm	DO %Sat	DO mg/l	Redox mV
RM38.5	61494	134031	64.7	8.53	42.9	101.4	9.59	336
RM38.6-S	61494	135207	67.8	8.72	43.2	112.6	10.28	359
-3	61494	135255	64.1	8.47	42.8	101.2	9.63	374
-6	61494	135341	63.6	8.38	42.7	100.6	9.62	380
-9	61494	135424	63.4	8.35	42.6	100.4	9.63	384
-12	61494	135505	63.3	8.34	42.6	100.3	9.64	386
-15	61494	135550	63.2	8.32	42.5	100.6	9.67	389
RM39.0L-S	61494	140237	70.7	9.13	44.9	117.3	10.38	350
-3	61494	140322	66.9	8.68	43.5	107.3	9.89	373
-6	61494	140408	64.1	8.48	42.6	103.3	9.83	384
-9	61494	140449	64.1	8.43	42.6	103.7	9.87	387
RM39.0R-S	61494	141205	64.7	8.47	42.8	102	9.64	379
-3	61494	141249	64.4	8.38	42.8	101	9.59	386
-6	61494	141322	63.6	8.34	42.7	100.7	9.64	390
-9	61494	141405	63.4	8.33	42.7	100.2	9.61	392
-12	61494	141504	63.5	8.33	42.9	100.2	9.61	394
-15	61494	141725	63.4	8.34	42.9	100.2	9.61	395
RM39.9-S	61494	142537	64.1	8.42	43.2	103.6	9.86	385
-3	61494	142653	63.5	8.35	43.1	103	9.87	392
-6	61494	142812	62.9	8.36	43.2	102.8	9.92	395
-9	61494	142903	62.8	8.37	42.8	103	9.95	395
RM40.75-S	61494	143839	62.9	8.45	43	103.1	9.95	385
-3	61494	143906	62.1	8.4	42.9	102.9	10.02	389
-6	61494	144025	61.7	8.37	42.8	102.3	10.01	394
-9	61494	144057	61.7	8.37	42.8	102.9	10.07	395
RM41.3-S	61494	144902	62.1	8.54		100.6	9.8	382
-3	61494	144937	61.6	8.41	42.5	100.4	9.84	390
-6	61494	145011	61.6	8.39	42.5	100.3	9.83	393
-9	61494	145042	61.6	8.35	42.5	100.3	9.83	395
RM42.3-S	61494	150043	61.6	8.55	42.3	98.8	9.67	383
-3	61494	150136	61.6	8.38	42.2	98.7	9.67	394
-6	61494	150224	61.6	8.36	42.3	98.7	9.67	395
-9	61494	150304	61.5	8.34	42.1	98.5	9.66	397
RM43.25-S	61494	151731	61.4	8.49	42.6	100.6	9.89	388
-3	61494	151817	61.3	8.41	42.6	100.8	9.91	392
-6	61494	151852	61.3	8.39	42.4	100.8	9.9	395

Appendix 9. Water quality parameters measured in Mokelumne River and Lake Lodi, May 26, 1994 through July 25, 1994.

River Mile/ Depth	Date MMDDYY	Time HHMMSS	Temp degF	pH units	SpCond uS/cm	DO %Sat	DO mg/l	Redox mV
RM-38.5	62194	142602	67.8	8.7	44	102.6	9.36	357
RM-38.6-S	62194	143448	72.7	8.62	44.5	111.8	9.68	383
-3	62194	143532	66.4	8.53	43.5	105.7	9.8	391
-6	62194	143616	65.7	8.46	43.4	104.5	9.77	396
-9	62194	143656	65.5	8.45	43.6	104	9.75	398
-12	62194	143741	65.3	8.43	43.8	103.2	9.69	401
-15	62194	143833	64.9	8.37	43.4	99.7	9.4	405
RM-39.0L-S	62194	144420	71.9	8.69	44.5	116.1	10.13	382
-3	62194	144501	67.3	8.6	43.4	113.9	10.45	389
-6	62194	144558	66.8	8.77	43.3	115.2	10.63	383
RM-39.0R-S	62194	145037	70.4	8.47	44.1	108.4	9.62	389
-3	62194	145117	68.4	8.41	44	105.8	9.6	394
-6	62194	145217	65.7	8.39	43.7	104.7	9.79	398
-9	62194	145257	65.1	8.38	43.6	104	9.78	401
-12	62194	145357	65	8.4	43.5	103.5	9.75	401
-15	62194	145444	65	8.4	43.5	103.3	9.73	402
RM39.9S	62194	150320	67.4	8.37	43.5	104.6	9.59	397
-3	62194	150446	66.3	8.38	43.1	103.9	9.65	399
-6	62194	150542	64.5	8.39	42.8	103.2	9.78	401
-9	62194	150630	64.4	8.41	43.3	103.3	9.8	402
RM40.75-S	62194	151544	67.4	8.43	43.7	107	9.81	395
-3	62194	151644	66.3	8.44	43.6	106.7	9.9	396
-6	62194	151811	65.6	8.47	43.3	106.3	9.95	397
-9	62194	151938	64.6	8.47	43.3	106	10.04	401
RM-41.3-S	62194	152838	65.8	8.43	43.9	106.2	9.92	391
-3	62194	152942	64.6	8.44	43.6	105	9.94	393
-6	62194	153029	63.5	8.43	43.7	104.1	9.97	396
-9	62194	153118	63.4	8.43	43.6	103.9	9.97	397
RM-42.3-S	62194	153945	63.3	8.37	43.3	100.6	9.66	395
-3	62194	154025	62.8	8.34	43.2	100.6	9.72	399
-6	62194	154100	62.6	8.33	43.2	100.4	9.72	400
-9	62194	154139	62.4	8.33	43.2	100.4	9.75	402
RM-43.25-S	62194	155011	62.8	8.39	42.6	102.1	9.87	396
-3	62194	155051	62.7	8.37	42.6	101.9	9.86	398
-6	62194	155230	62.6	8.38	42.6	102	9.87	401
	62194	155548	62.6	8.4	42.6	101.8	9.85	403
-9	62194	155617	62.7	8.4	42.6	101.7	9.84	404

Appendix 9. Water quality parameters measured in Mokelumne River and Lake Lodi, May 26, 1994 through July 25, 1994.

River Mile/ Depth	Date MMDDYY	Time HHMMSS	Temp degF	pH units	SpCond uS/cm	DO %Sat	DO mg/l	Redox mV
RM-38.5	62894	132208	72.1	8.53	45.8	101.7	8.86	351
RM-38.6-S	62894	133545	75.8	8.55	45.7	110.8	9.28	370
	62894	133641	70	8.5	44.8	106.2	9.46	377
-3	62894	133706	70.2	8.47	44.8	105.4	9.37	379
-6	62894	133802	69.2	8.43	44.6	105.1	9.45	384
-9	62894	133853	68.9	8.39	44.6	103.2	9.31	388
-12	62894	133938	68.4	8.36	44.6	100.2	9.09	391
-15	62894	134102	68	8.27	44.7	92.8	8.45	397
RM-39.0L-S	62894	134654	76.2	8.66	46.3	114.6	9.57	375
-3	62894	134819	71	8.57	45	108.4	9.56	383
-6	62894	134932	70.2	9.52	43.8	124.5	11.07	353
RM-39.0R-S	62894	135352	76	8.49	46	107.2	8.96	382
-3	62894	135448	71.2	8.43	44.7	103.6	9.11	389
-6	62894	135555	69.4	8.39	44.5	103	9.24	394
-9	62894	135738	68.6	8.39	44.4	102.1	9.23	398
-12	62894	135858	68.5	8.39	44.3	101.8	9.22	398
RM-39.9-S	62894	140401	71.6	8.47	44.7	106.3	9.32	387
-3	62894	140452	70.3	8.42	44.6	104.6	9.29	392
-6	62894	140541	68.8	8.43	44.3	103.8	9.38	394
-9	62894	140644	68.4	8.4	44.3	103.4	9.38	397
	62894	141324	73	8.45	45	106	9.15	389
	62894	141328	73	8.4	44.9	105.9	9.14	392
RM-40.75-S								
-3	62894	141456	68.9	8.41	44.3	102.9	9.28	395
-6	62894	141552	67.5	8.39	44.3	102.3	9.37	398
-9	62894	141631	67.1	8.41	44.2	101.9	9.38	398
RM-41.3-S	62894	142155	70.6	8.48	44.6	108	9.56	390
-3	62894	142250	67.9	8.46	44.2	105.6	9.64	393
-6	62894	142340	67.4	8.47	44	105.2	9.65	395
-9	62894	142430	67.2	8.47	43.9	105.2	9.67	396
RM-42.3-S	62894	143059	68.5	8.39	44.6	103	9.33	394
-3	62894	143154	67.3	8.4	44.5	101.8	9.35	395
-6	62894	143245	66.6	8.39	44.4	101.5	9.39	397
-9	62894	143340	66.5	8.41	44.3	101.6	9.41	397
RM-43.25-S	62894	144456	65.6	8.4	43.8	99.6	9.32	395
-3	62894	144553	65.3	8.37	43.6	99.4	9.33	398
-6	62894	144700	65.2	8.38	44.1	99.3	9.33	399

Appendix 9. Water quality parameters measured in Mokelumne River and Lake Lodi, May 26, 1994 through July 25, 1994.

River Mile/ Depth	Date MMDDYY	Time HHMMSS	Temp degF	pH units	SpCond uS/cm	DO %Sat	DO mg/l	Redox mV
RM38.5	70594	132536	71.7	8.51	45.2	101	8.83	355
	70594	133444	74.1	8.43	45	105	8.96	376
RN38.6-S	70594	133604	74.3	8.41	45	105.1	8.95	380
-3	70594	133651	69.8	8.36	44.4	100	8.93	386
-6	70594	133736	69.2	8.3	44.3	99.2	8.91	391
-9	70594	133822	69.1	8.34	44.2	99.9	8.99	390
-12	70594	133909	69	8.32	44.2	99.5	8.97	392
-15	70594	134007	68.9	8.33	44.2	99.2	8.95	393
RM39.0L-S	70594	134530	77	8.67	47.6	113.5	9.4	374
-3	70594	134614	70.8	8.55	44.8	106.3	9.39	383
-6	70594	134654	69.9	8.51	44.2	108.4	9.67	387
-9	70594	134740	69.7	8.44	44	106.1	9.49	392
RM39.0R-S	70594	135152	74.4	8.4	45.5	104.7	8.9	390
-3	70594	135246	70.9	8.32	44.8	101.8	8.98	395
-6	70594	135339	69.2	8.31	44.2	101.8	9.16	397
-9	70594	135428	68.9	8.32	44.3	101.1	9.12	398
-12	70594	135507	68.7	8.32	44.2	100.9	9.12	398
-15	70594	135550	68.7	8.32	43.9	100.6	9.09	399
RM39.9-S	70594	140018	71.4	8.34	44.9	104.3	9.16	390
-3	70594	140058	69.5	8.33	44.7	101.6	9.1	392
-6	70594	140138	68	8.33	44.5	101.5	9.25	394
-9	70594	140215	67.7	8.33	44.4	101.3	9.26	395
-12	70594	140310	67.7	8.34	44.4	101.3	9.26	395
RM40.75-S	70594	140803	70.3	8.5	44.6	107.3	9.52	385
-3	70594	140853	68.8	8.5	44.6	106.8	9.64	388
-6	70594	140942	67.4	8.5	44.4	105.3	9.66	390
-9	70594	141023	66.7	8.5	44	105.2	9.72	391
RM41.3-S	70594	141445	68.4	8.51	44.8	106.6	9.66	388
-3	70594	141528	67.3	8.5	44.6	106.3	9.76	390
-6	70594	141612	66.9	8.51	44.6	105.7	9.75	392
-9	70594	141643	66.6	8.52	44.3	106	9.81	392
RM42.3-S	70594	142144	65	8.39	44.3	100.7	9.49	395
-3	70594	142217	64.5	8.41	44.1	100.6	9.53	395
-6	70594	142251	64.3	8.41	44.2	100.7	9.57	396
-9	70594	142328	64.1	8.42	44.1	100.9	9.6	397
RM43.25-S	70594	142836	63.8	8.44	43.8	100.2	9.57	393
-3	70594	142914	63.8	8.41	43.7	100.5	9.6	395
-6	70594	142954	63.7	8.42	43.7	100.3	9.59	396

Appendix 9. Water quality parameters measured in Mokelumne River and Lake Lodi, May 26, 1994 through July 25, 1994.

River Mile/ Depth	Date MMDDYY	Time HHMMSS	Temp degF	pH units	SpCond uS/cm	DO %Sat	DO mg/l	Redox mV
RM38.5	71294	133921	73	8.68	45.6	101.9	8.79	363
RM38.6-S	71294	134907	76.5	8.64	45.4	108.9	9.06	363
-3	71294	135015	71.6	8.65	45.1	107.4	9.41	370
-6	71294	135055	70.8	8.61	45	105.7	9.34	374
-9	71294	135135	70.5	8.59	45.3	103.7	9.19	377
-12	71294	135213	70.2	8.53	44.7	100.5	8.93	382
-15	71294	135245	70	8.49	44.7	97.8	8.72	381
RM39.0R-S	71294	135902	74.8	8.6	45.6	105.3	8.92	377
-3	71294	135938	73.2	8.59	45.6	105.6	9.1	380
-6	71294	140019	70.7	8.56	45.3	103.6	9.16	384
-9	71294	140051	70.1	8.56	45.1	102.7	9.14	386
-12	71294	140137	70	8.56	45.1	102.6	9.15	387
-15	71294	140230	70	8.55	45.3	102.6	9.15	389
RM39.0L-S	71294	140950	77.1	8.98		117	9.68	368
-3	71294	141044	73.1	8.7	45.7	109.4	9.43	383
-6	71294	141130	71.4	8.7	45.1	108.3	9.51	385
-9	71294	141227	71.4	8.72	45.1	110.3	9.68	385
RM39.9-S	71294	141959	72.4	8.58	45.6	106.7	9.27	386
-3	71294	142025	72.1	8.59	45.9	106.4	9.27	387
-6	71294	142100	70.1	8.58	45.4	105.1	9.35	390
-9	71294	142205	69.7	8.6	45.1	104.9	9.38	391
-12	71294	142310	69.6	8.62	45.3	105.3	9.42	391
RM40.75-S	71294	143023	71.9	8.58	45.4	107.3	9.36	386
-3	71294	143105	69.6	8.58	45.1	104.6	9.37	389
-6	71294	143135	68.2	8.58	44.9	104	9.46	390
-9	71294	143203	67.7	8.57	44.8	104	9.51	392
RM41.3-S	71294	143740	70.7	8.68	45.2	109.3	9.66	384
-3	71294	143825	69.3	8.68	45	108	9.7	386
-6	71294	143855	68.5	8.69	44.8	108.4	9.83	387
-9	71294	143947	68.4	8.71	44.9	108.5	9.84	388
RM42.3-S	71294	144711	68.3	8.52	45	103.1	9.36	389
-3	71294	144747	66.8	8.52	45	101.7	9.39	391
-6	71294	144822	66.3	8.52	44.7	102	9.48	392
-9	71294	144853	66.2	8.52	44.9	101.9	9.47	393
RM43.25-S	71294	145438	65.3	8.58	44.3	101.1	9.5	389
-3	71294	145511	65.3	8.53	44.3	100.9	9.47	392
-6	71294	145537	65.2	8.52	44.5	100.7	9.47	393

Appendix 9. Water quality parameters measured in Mokelumne River and Lake Lodi, May 26, 1994 through July 25, 1994.

River Mile/ Depth	Date MMDDYY	Time HHMMSS	Temp degF	pH units	SpCond uS/cm	DO %Sat	DO mg/l	Redox mV
RM38.5	71994	134924	71.4	8.63	45.7	102.1	8.96	382
RM38.6-S	71994	135806	73.2	8.51	45.8	103.8	8.94	382
-3	71994	135848	73.1	8.51	45.9	103.5	8.92	385
-6	71994	135921	69.4	8.44	44.7	98.9	8.88	391
-9	71994	140003	69.2	8.45	44.9	101.1	9.09	394
-12	71994	140033	69.1	8.45	44.8	100.8	9.07	395
-15	71994	140105	69.1	8.48	44.8	100.9	9.08	395
RM39.0L-S	71994	140529	74.8	8.61	44.6	108.5	9.19	386
	71994	140532	74.6	8.57	46.9	109.3	9.27	389
-3	71994	140609	70.7	8.61	45.2	105.6	9.35	390
-6	71994	140639	69.7	8.6	44.8	105	9.38	392
-9	71994	140710	69.6	8.58	44.5	105.1	9.4	394
RM39.0R-S	71994	141110	73.1	8.57	45.8	104.5	9.01	392
-3	71994	141146	70.2	8.59	45.2	103.3	9.19	393
-6	71994	141218	69.4	8.54	44.9	102.4	9.18	398
-9	71994	141249	68.7	8.52	44.7	102.1	9.23	400
-12	71994	141318	68.6	8.52	44.8	101.7	9.2	401
-15	71994	141352	68.6	8.54	45	101.6	9.2	401
RM39.9-S	71994	141907	70.9	8.57	44.9	104.1	9.19	393
-3	71994	141952	69.1	8.55	45.1	103.5	9.32	397
-6	71994	142019	68.6	8.55	45	103.3	9.35	398
-9	71994	142054	68.3	8.56	45	102.8	9.34	399
-12	71994	142126	68.3	8.59	44.8	103.1	9.36	398
RM40.75-S	71994	142754	70.5	8.58	45.3	104.4	9.26	395
-3	71994	142825	69.4	8.6	45.1	103.8	9.32	395
-6	71994	142853	67.3	8.59	44.8	102.5	9.41	397
-9	71994	142927	66.8	8.58	44.5	102.6	9.48	399
RM41.3-S	71994	143505	69	8.65	44.8	107.6	9.69	395
-3	71994	143540	67.4	8.68	45	106.5	9.76	394
-6	71994	143622	67	8.66	44.9	106.3	9.8	396
-9	71994	143651	66.8	8.68	44.9	106.4	9.82	396
RM42.3-S	71994	144256	65.5	8.59	44.6	102.2	9.58	395
-3	71994	144328	65.2	8.57	44.4	102	9.59	397
-6	71994	144420	65.2	8.54	44.6	101.7	9.56	400
-9	71994	144449	65	8.54	44.4	101.6	9.58	401
RM43.25-S	71994	145007	64.5	8.63		100	9.47	388
-3	71994	145045	64.3	8.6	44.2	99.8	9.48	392
-6	71994	145115	64.3	8.56	44.2	99.9	9.49	396

Appendix 9. Water quality parameters measured in Mokelumne River and Lake Lodi, May 26, 1994 through July 25, 1994.

River Mile/ Depth	Date MMDDYY	Time HHMMSS	Temp degF	pH units	SpCond uS/cm	DO %Sat	DO mg/l	Redox mV
RM38.5	72594	130128	69.9	8.71		100.4	8.96	386
RM38.6-S	72594	131138	73.3	8.57	45.7	106.3	9.14	379
-3	72594	131227	68.2	8.65	45.2	104.5	9.51	381
-6	72594	131310	67.6	8.61	45	101.5	9.28	385
-9	72594	131340	67.4	8.58	45	100.2	9.19	389
-12	72594	131419	67.2	8.56	44.7	100.3	9.21	392
-15	72594	131503	66.7	8.5	44.4	95	8.78	394
RM39.0L-S	72594	131824	75.2	8.6	47.7	103.7	8.74	388
-3	72594	131858	69.8	8.57	45.7	101.2	9.03	394
-6	72594	131927	68.4	8.62	44.9	103.8	9.42	393
-9	72594	132020	68	8.63	44.6	104.2	9.49	395
RM39.0R-S	72594	132347	73.1	8.58	45.8	105.1	9.06	395
-3	72594	132503	69.2	8.57	45	100.9	9.07	399
-6	72594	132549	67.8	8.58	44.8	100.5	9.18	401
-9	72594	132649	67.4	8.59	44.8	100.5	9.22	402
-12	72594	132735	67.2	8.56	44.7	100.1	9.19	405
-15	72594	132752	67.2	8.57	44.7	99.9	9.18	404
RM39.9-S	72594	133753	69.3	8.6	45.1	103.9	9.33	394
-3	72594	133831	69	8.6	45.3	103.7	9.34	395
-6	72594	133906	67.4	8.59	44.9	102.5	9.4	398
-9	72594	133936	67.1	8.61	45.1	102.2	9.4	398
-12	72594	134008	67.1	8.59	45.3	102.2	9.41	401
RM40.75-S	72594	134506	68	8.59	45.1	102.6	9.35	398
-3	72594	134554	67.8	8.59	45	103.3	9.43	400
-6	72594	134629	66.7	8.62	45	103.1	9.53	399
-9	72594	134707	65.5	8.64	44.9	101.6	9.51	400
RM41.3	72594	135054	67.9	8.69	45.2	106.8	9.75	394
-3	72594	135145	66.4	8.69	45	105.4	9.77	396
-6	72594	135220	66	8.68	45.1	105.3	9.81	398
-9	72594	135257	65.9	8.69	45	105.3	9.82	399
RM42.3-S	72594	135759	65.9	8.62	45.3	101.2	9.44	398
-3	72594	135828	65	8.61	45	101.4	9.56	400
-6	72594	135854	64.6	8.59	44.7	101.4	9.6	402
-9	72594	135925	64.5	8.59	45.1	101.5	9.61	403
RM43.25-S	72594	140409	64.1	8.59	44.6	99.3	9.45	403
-3	72594	140444	63.9	8.56	44.4	98.6	9.4	406
-6	72594	140528	63.8	8.56	44.5	98.6	9.42	407

Appendix 10. Fall Chinook Smolt Physiology Data - 1994

Location	Date	Fish #	FL(mm)	TL(mm)	WT(g)	K	Sp. Act.	Total ATPase	Total Protein
UPSHAB	03/25/94	1	45	48	0.9	8.14E-04	2.28	2.34	1.03
UPSHAB	03/25/94	2	51	55	1.5	9.02E-04	1.89	2.16	1.14
UPSHAB	03/25/94	3	50	53	1.2	8.06E-04	2.19	1.42	0.65
UPSHAB	03/25/94	4	43	45	0.7	7.68E-04	7.98	3.76	0.47
UPSHAB	03/25/94	5	56	60	1.7	7.87E-04	3.11	2.9	0.93
UPSHAB	03/25/94	6	57	61	1.8	7.93E-04	3.28	3.15	0.96
UPSHAB	03/25/94	7	55	59	1.7	8.28E-04	3.36	4.69	1.39
UPSHAB	03/25/94	8	60	65	2.2	8.01E-04	0.59	0.93	1.56
UPSHAB	03/25/94	9	55	59	1.6	7.79E-04	1.62	1.79	1.1
UPSHAB	03/25/94	10	53	56	1.4	7.97E-04	2.7	3.33	1.23
WIDD	04/11/94	1	76	82	4	7.25E-04	3.69	9.69	2.63
WIDD	04/11/94	2	89	98	7.2	7.65E-04	3.97	19.68	4.96
WIDD	04/11/94	3	82	91	5.8	7.43E-04	4.2	10.43	2.48
WIDD	04/11/94	4	84	93	6.2	7.71E-04	2.7	10.86	4.02
WIDD	04/11/94	5	93	102	8.4	7.92E-04	5.2	14.13	2.72
WIDD	04/11/94	6	76	83	4.6	8.04E-04	4.29	13.14	3.06
WIDD	04/11/94	7	77	84	4.2	7.09E-04	3.57	9.93	2.79
UPSHAB	04/12/94	1	81	89	3.5	4.96E-04	1.92	5.31	2.76
UPSHAB	04/12/94	2	71	77	1.9	4.16E-04	1.31	1.6	1.22
UPSHAB	04/12/94	3	83	75	2.5	5.93E-04	0.47	0.99	2.11
UPSHAB	04/12/94	4	73	68	1.9	6.61E-04	3.02	4.69	1.55
UPSHAB	04/12/94	5	69	63	1.3	5.20E-04	2.7	4.81	1.78
UPSHAB	04/12/94	6	68	63	1.2	4.80E-04	1.91	2.04	1.07
UPSHAB	04/12/94	7	65	58	1	5.13E-04	1.57	2.04	1.3
UPSHAB	04/12/94	8	54	50	0.8	6.40E-04	1.47	1.73	1.17
UPSHAB	04/25/94	1	67	73	3.5	9.00E-04	3.94	8.27	2.1
UPSHAB	04/25/94	2	69	76	4	8.43E-04	2.69	9.07	3.38
UPSHAB	04/25/94	3	76	84	4.6	7.76E-04	4.23	12.09	2.86
UPSHAB	04/25/94	4	80	89	5.7	8.09E-04	1.99	10.12	5.09
UPSHAB	04/25/94	5	68	74	3.5	8.64E-04	2.68	7.16	2.67
UPSHAB	04/25/94	6	70	76	3.8	8.66E-04	3.74	8.02	2.14
UPSHAB	04/25/94	7	72	79	4.3	8.72E-04	4.03	11.23	2.79
WIDD	04/25/94	1	101	110	10	7.51E-04	3.43	13.7	3.99
WIDD	04/25/94	2	93	102	8.4	7.92E-04	4.03	16.23	4.03
WIDD	04/25/94	3	105	116	12.7	8.14E-04	5	20.24	4.05
WIDD	04/25/94	4	99	108	8.8	6.99E-04	4.86	14.31	2.95
WIDD	04/25/94	5	86	96	6.6	7.46E-04	4.44	13.82	3.11
WIDD	04/25/94	6	87	94	7.3	8.79E-04	3.07	11.68	3.79
UPSHAB	05/10/94	1	76	82	5	9.07E-04	3.37	12.71	3.78
UPSHAB	05/10/94	2	80	87	6	9.11E-04	2.52	9.75	3.87
UPSHAB	05/10/94	3	75	82	5	9.07E-04	2.68	9.07	3.38
UPSHAB	05/10/94	4	77	83	4.5	7.87E-04	3.93	17.95	4.57
UPSHAB	05/10/94	5	75	81	4	7.53E-04	2.9	10.55	3.63
UPSHAB	05/10/94	6	75	81	5	9.41E-04	3.48	9.81	2.82
WIDD	05/10/94	1	102	93	9.4	1.17E-03	7.17	19.62	2.74
WIDD	05/10/94	2	93	84	6.5	1.10E-03	5.74	22.52	3.92
WIDD	05/10/94	3	95	87	6.5	9.87E-04	6.07	21.41	3.53
WIDD	05/10/94	4	90	82	5.4	9.79E-04	5.23	14.99	2.87
WIDD	05/10/94	5	94	85	6.5	1.06E-03	3.3	17.77	5.38
WIDD	05/10/94	6	83	75	4.5	1.07E-03	6.95	16.29	2.34
UPSHAB	05/23/94	1	84	93	6.3	7.83E-04	1.94	6.66	3.42
UPSHAB	05/23/94	2	78	85	5.4	8.79E-04	2.49	8.11	3.26
UPSHAB	05/23/94	3	76	83	5.2	9.09E-04	3.89	12.19	3.13
UPSHAB	05/23/94	4	74	82	5.5	9.98E-04	2.26	5.39	2.38
UPSHAB	05/23/94	5	72	80	5	9.77E-04	1.08	3.7	3.43
UPSHAB	05/23/94	6	78	87	5.9	8.96E-04	2.6	7.22	2.78
WIDD	05/23/94	1	101	110	10.3	7.74E-04	1.8	5.06	2.81
WIDD	05/23/94	2	91	100	6	8.00E-04	3.07	9.36	3.05
WIDD	05/23/94	3	89	99	7.2	7.42E-04	2.73	6.47	2.37
WIDD	05/23/94	4	90	98	7.5	7.97E-04	0.89	2.34	2.63
WIDD	05/23/94	5	90	98	8.2	8.71E-04	0.62	2.06	3.35
WIDD	05/23/94	6	92	102	7.9	7.44E-04	4.86	9.98	2.06
WIDD	06/10/94	1	95	105	9.8	8.47E-04	3.37	9	2.67
WIDD	06/10/94	2	102	112	9.5	6.76E-04	2.06	5.63	2.73
WIDD	06/10/94	3	89	96	7.1	8.02E-04	1.97	3.66	1.85
WIDD	06/10/94	4	87	95	7.3	8.51E-04	0.71	1.69	2.38
WIDD	06/10/94	5	95	104	8.6	7.65E-04	2.98	5.53	1.86
WIDD	06/10/94	6	95	100	8.2	8.20E-04	3.63	7.92	2.18
WIDD	06/10/94	7	100	107	10	8.16E-04	1.75	4.59	2.62
UPSHAB	06/24/94	1	87	95	7.9	9.21E-04	0.48	2.2	4.55
WIDD	06/24/94	1	98	110	10.8	8.11E-04	2.44	9.75	4
WIDD	06/24/94	2	100	110	11	8.26E-04	3.27	13.36	4.09
WIDD	06/24/94	3	105	118	13.8	8.84E-04	2.57	10.86	4.22
WIDD	06/24/94	4	96	105	10.6	9.16E-04	1.04	5.11	4.9
WIDD	06/24/94	5	92	101	8.9	8.64E-04	1.96	5.67	2.9
WIDD	06/24/94	6	98	108	11.6	9.21E-04	1.92	6.47	3.37
WIDD	06/24/94	7	105	114	13.3	8.98E-04	4.21	16.27	3.86
WIDD	07/10/94	1	116	127	14.1	8.88E-04	1.21	6.42	5.33
WIDD	07/10/94	2	117	127	12.4	6.05E-04	1.75	8.9	5.09
WIDD	07/10/94	3	100	110	10.4	7.81E-04	5.36	14.37	2.68
WIDD	07/10/94	4	100	112	11.1	7.90E-04	1.99	10.72	5.38
WIDD	07/10/94	5	95	104	8.9	7.91E-04	2.25	7.94	3.53
WIDD	07/10/94	6	94	104	6.7	7.73E-04	1.91	12.5	6.53
WIDD	07/10/94	7	87	95	7.9	9.21E-04	3.15	7.9	2.5
WIDD	07/23/94	1	88	97	7.3	8.00E-04	1.51	3.21	2.13
WIDD	07/23/94	2	98	109	10.2	7.86E-04	0.53	1.82	3.47
WIDD	07/23/94	3	101	111	8.4	8.14E-04	0.72	3.04	4.2
WIDD	07/23/94	4	101	111	11.3	8.26E-04	1.73	6.86	3.97
WIDD	07/23/94	5	102	112	10.9	7.76E-04	2.63	9.2	3.5
WIDD	07/23/94	6	90	100	8.9	8.90E-04	5.22	12.76	2.45
WIDD	07/23/94	7	110	120	14.9	8.62E-04	3.14	9.03	2.87